OCTOBER 8, 1951

Electrical World

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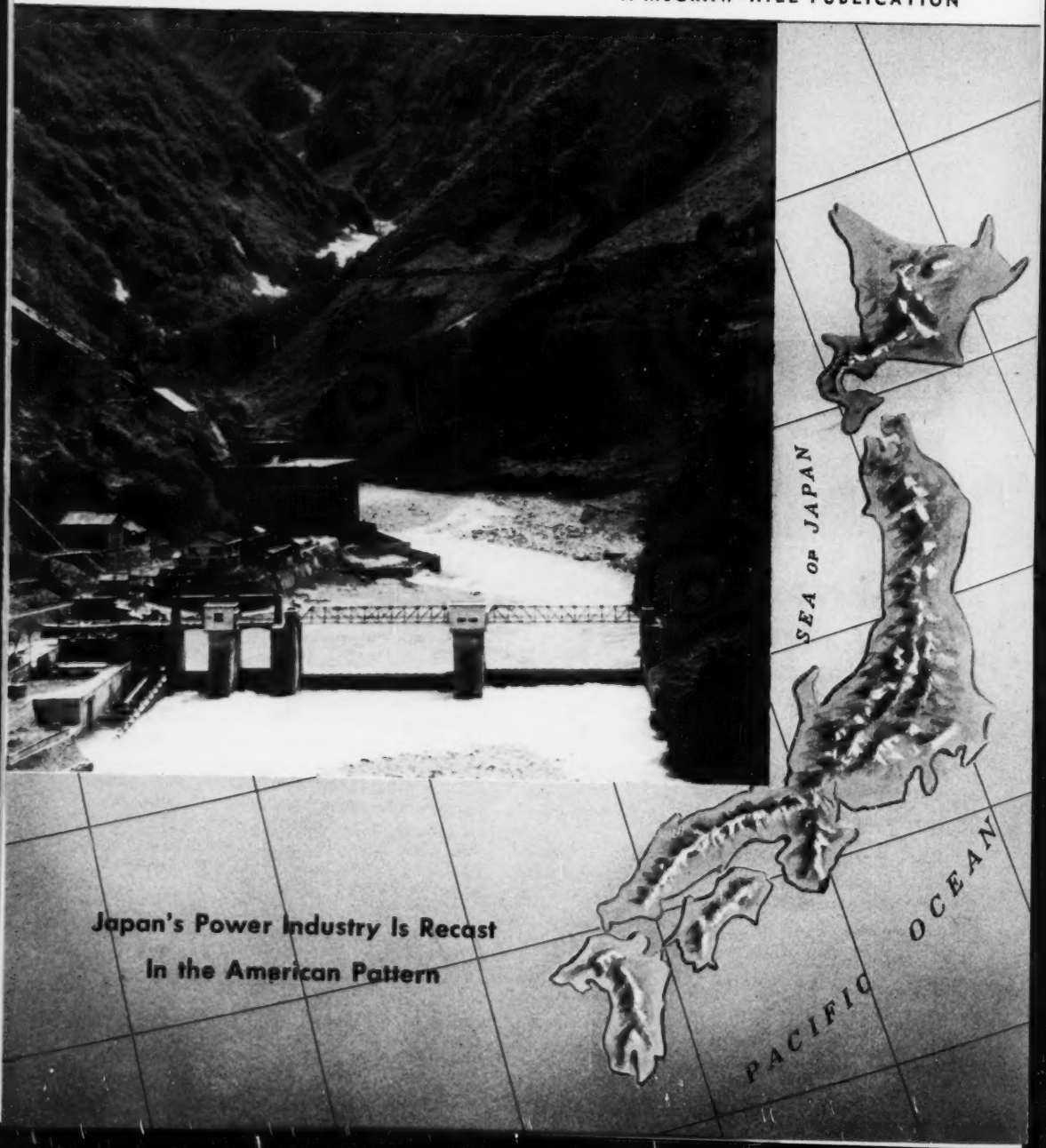
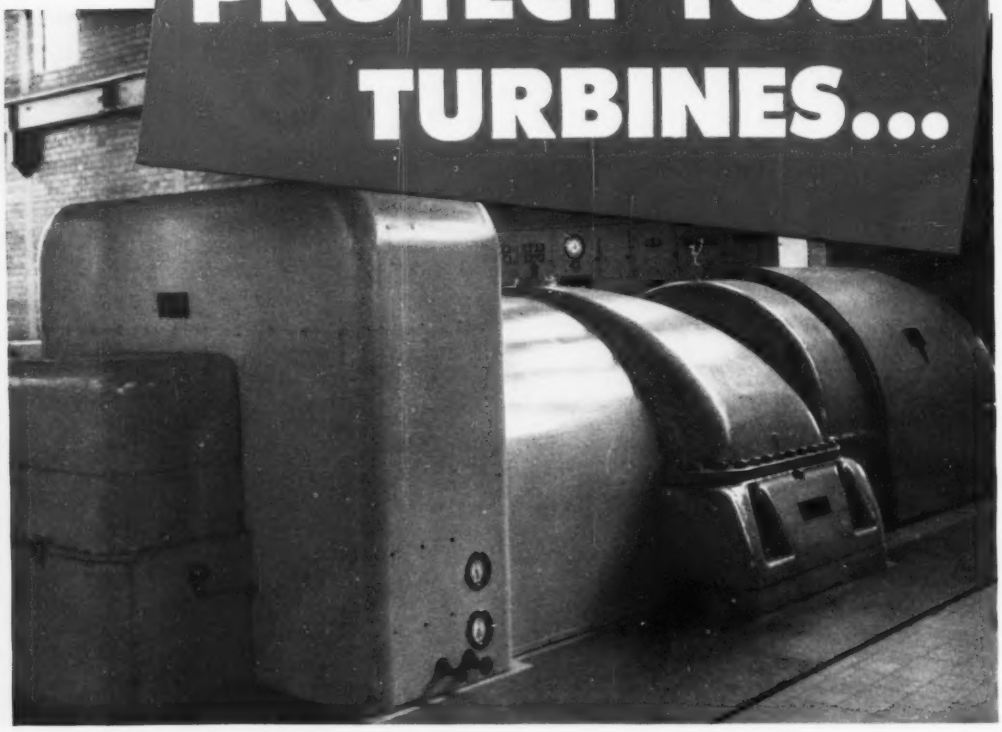


Japan's Power Industry Is Recast In the American Pattern

PROTECT YOUR TURBINES...



Keep 'em rust-free, sludge-free and foam-free with TEXACO REGAL OIL (R&O)

IT MAKES no difference what the size of your turbines . . . or whether they're steam or hydro. *You can't buy better lubrication than Texaco Regal Oil (R&O)!*

Texaco Regal Oil (R&O) is made from top-grade stocks, specially refined and processed. Special Texaco additives make it *more than ten times as resistant to oxidation* as ordinary turbine oils . . . assure vastly increased protection against rust. *Texaco Regal Oil (R&O)* will not foam.

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TEXACO Regal Oils (R&O)

FOR ALL TURBINES

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

A NOTE ON HISTORY

Japan emerged from World War II with one big generation and transmission company, and nine affiliated distribution companies. Together they controlled 90% of the country's power resources and practically all of the business. They were regulated by a government-appointed bureau.

Then came the post-surrender agreement which held that "large Japanese combines would be broken up."

To do the breaking-up, and the following interminably detailed job of reorganization, a five-man board was appointed to advise General MacArthur on matters dealing with the reorganization of large industrial companies regarded as monopolistic and marked for dissolution under the law.

One member of this board (called the Deconcentration Review Board) was Edward J. Burger, a vice-president and director of the Ohio Public Service Co. Burger had put in some time as a member of a utilities consulting group on reparation problems—as they affected the electric utilities of Japan—and is now the manager of Ohio Edison's Lake Erie Division in Lorain, Ohio.

Never before have the threads of fate spun themselves to re-pattern a vast industry so completely in such a short space of time.

The reorganization of Japan's electric power was bitterly opposed—by high government officials who were reluctant to lose control of 146,000 employees and ten companies—by the officers and directors of the Japan Generating and Transmission Company—by the officials and the rank and file of labor unions—and finally, by all the organizations who fought for socialism.

Edward J. Burger wrote the reorganization order and in this issue of Electrical World he tells you how Japan's monopolistic power industry was recast into the American pattern of free enterprise—what the job was, why it had to be done, and the forces that opposed it.

This story is, perhaps, a little off the regular track of Electrical World's editorial content, which usually concerns itself with inter-industry news, problems and their solutions, and management.

But engineering and industry can transcend national boundaries—and we're glad to bring you this first-hand report of history as it happens.

Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing or applying electric power

Vol. 136 No. 15 — October 8, 1951

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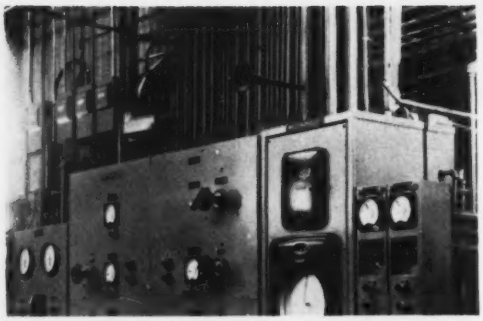
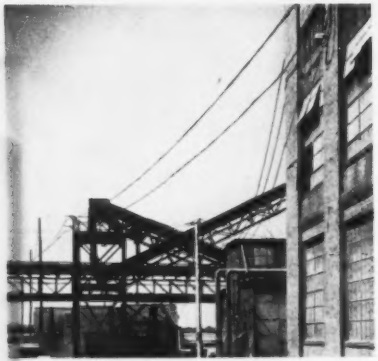


Maze of conduit carries Okolite-Okoprene control and power wiring from control panel to Kamyr Pulp Drying Machine. A major portion of the equipment in the motor generator sub-station is also controlled from this switchboard.

Motor generator room, showing 2300 entrance breakers, 550-volt distribution breakers, motor generator set and electronic speed regulator cubicles. All of these, both a-c and d-c, are fed by Okolite-Okoprene cable.



Okolite-Okoprene self-supporting aerial cables distribute power to transformer sub-stations from the Power House. "Stormsafe" aerial cable eliminates congestion, reduces clearance problems, and provides triple economy of quick installation, low maintenance costs and better voltage regulation.

why it pays to use OKOLITE-OKOPRENE CABLES *throughout* THE JOB

The Story of an Okolite-Okoprene Installation at a Large Southern Pulp & Paper Mill

MORE and more electrical engineers are specifying OKOLITE-OKOPRENE cables for complete installations. For when every electrical circuit on a job is OKOLITE-OKOPRENE, the degree of circuit security on that job is unequalled.

OKOLITE-OKOPRENE is especially suitable for complete installations because of its versatility. Highly resistant to every element which attacks cable, OKOLITE-OKOPRENE is used in wet, dry, hot or cold locations—exposed to weather or sunlight—underground or in conduit.

For instance, a large pulp manufacturer made extensive use of OKOLITE-OKOPRENE in installing a Kamyr Pulp Drying Machine. Power and control circuits, leads for the battery of synchronized generators and motors and circuit breakers, self-supporting aerial cable from sub-stations to the Power House—even push-button stations and the lighting system were OKOLITE-OKOPRENE.

The Company engineers selected OKOLITE-OKOPRENE throughout this job because of the necessity of keeping the Kamyr Machine in continuous operation. Resistant to moisture, heat, sunlight, oils, acids, ozone and chemicals, OKOLITE-OKOPRENE is the most economical and reliable way of supplying electrical power to key operations. The Okonite Company, Passaic, N. J.

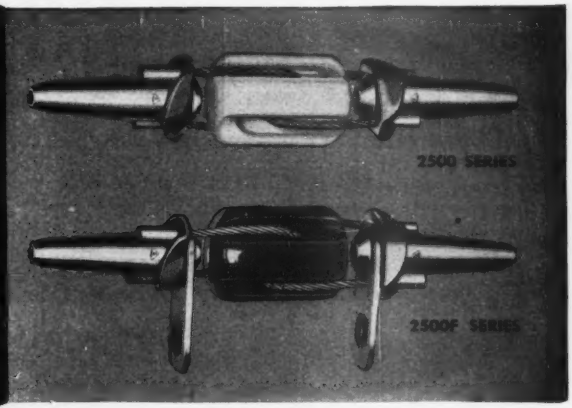
THE BEST CABLE IS YOUR BEST POLICY

OKONITE SINCE 1878 *insulated wires and cables*

9285

for the largest number of line applications at the lowest possible cost...

USE *Electroline* Insulating Automatic Line Splice SECTIONALIZERS



The Electroline Sectionalizers are assemblies that will function in service as most convenient, reliable and yet low cost interrupting devices. Series 2500-F and 2600 provide for paralleling with a fuse element for further protection when sectionalizing. The mechanical strength of these assemblies exceeds in all cases the rated breaking strength of the conductor for which they are adapted.

These Insulating Automatic Line Splice Sectionalizers are ideal for:

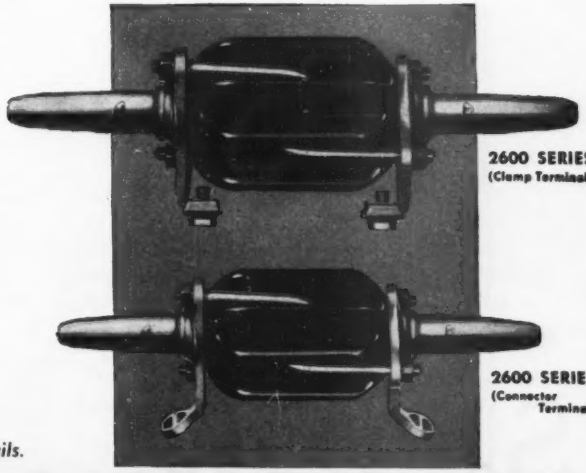
Installing Regulating Equipment,
simplifies cutting-in disconnecting points, fuses, voltage regulators and series capacitors;

Restoring Service,
providing points to test for trouble;

Sectionalizing Networks,
to readily isolate and test the area in trouble;

Series Street Lighting,
simplifies cutting-in series street lamps—merely cut the line and insert conductor ends into sectionalizer.

Send for Bulletins containing complete details.



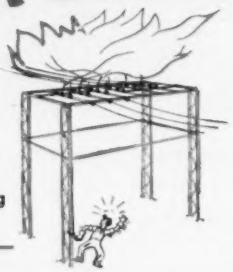
TALENT TO ORIGINATE E ABILITY TO PRODUCE

Electroline Company

4121 South La Salle Street • Chicago 9, Illinois

[illegible] SERVICES, LTD., TORONTO

Alduti INTERRUPTER SWITCHES



① Where Horn Gap Switches Are Inadequate

because horn gaps cannot, under all conditions, safely break magnetizing or charging currents; nor can they interrupt load currents

② Where Circuit Breakers Are Too Expensive

for non-automatic switching and short circuit protection

ALDUTI INTERRUPTER SWITCHES

offer a proved and economical solution to such application problems.

Ten years of operating experience in thousands of installations, and many field trials under severe test conditions, have demonstrated the ability of these Interrupter Switches to — safely and repeatedly —

- Sectionalize either radial or loop distribution and subtransmission circuits, under either load or charging current conditions . . .
- Switch load and magnetizing currents of transformer banks . . .
- Switch charging currents of capacitor banks.

And because there is NO EXTERNAL ARCING during the operation of Alduti Interrupter Switches: they need not be mounted horizontally upright, but can be mounted vertically, or underhung; hook stick operation can be employed where economy dictates; and phase spacings can be reduced to 18 inches for the 7,500-volt and 33 inches for the 34,500-volt switches. Hence structures can be smaller, connections simpler, and construction cost can be reduced below that of installing horn gap switches.

Also, Alduti Interrupter Switches can be metal-clad, thus providing—even for subtransmission applications — enclosed "packaged-type" switches, thereby permitting the complete enclosure of all components of a substation.

When combined with S&C Power Fuses, Alduti Fused Interrupters also provide short circuit protection with fault current interrupting ability up to 40,000 amperes asymmetrical, thus making possible the elimination of expensive circuit breakers where automatic switching is not required.

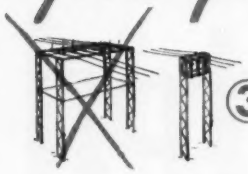
Alduti Interrupter Switches are supplied in these ratings:

Volts	Continuous Amperes	Interrupting Amperes, Nominal
For hook stick or group operation		
7500 & 15000	400, 600, 1200	400, 600
For group operation only		
23000 & 34500	600	600

S&C ELECTRIC COMPANY

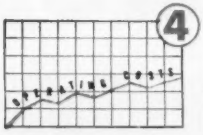
Formerly SCHWEITZER & CONRAD, INC. In Canada, Powerlite Devices, Limited, Toronto

give you Great Advantages:



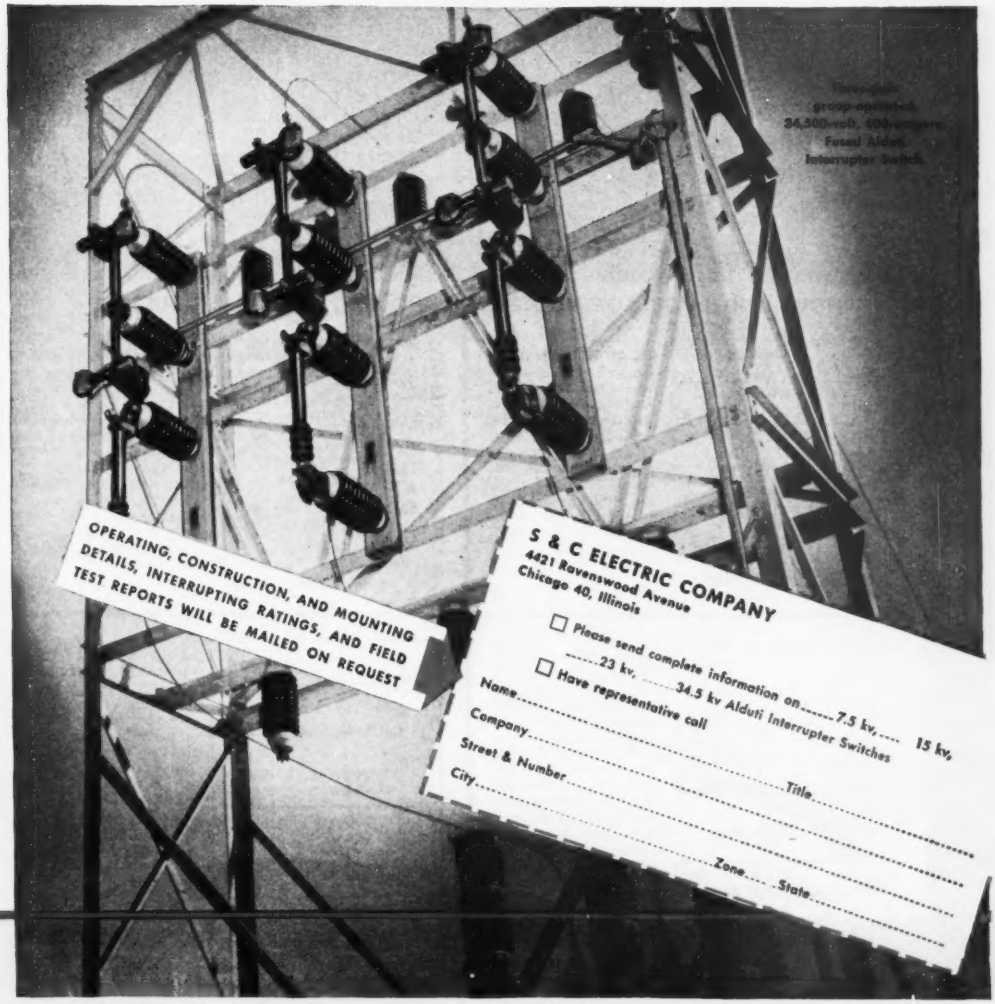
③ Where Structure Design Is Restricted

because horn gap switches can be mounted only in the horizontal upright position, and need wide phase spacings



④ Where Switching Sequences Are Complicated And Costly

because multiple operations—involving breakers, disconnects, and operating personnel— are required to isolate equipment or sectionalize circuits


OPERATING, CONSTRUCTION, AND MOUNTING DETAILS, INTERRUPTING RATINGS, AND FIELD TEST REPORTS WILL BE MAILED ON REQUEST
S & C ELECTRIC COMPANY
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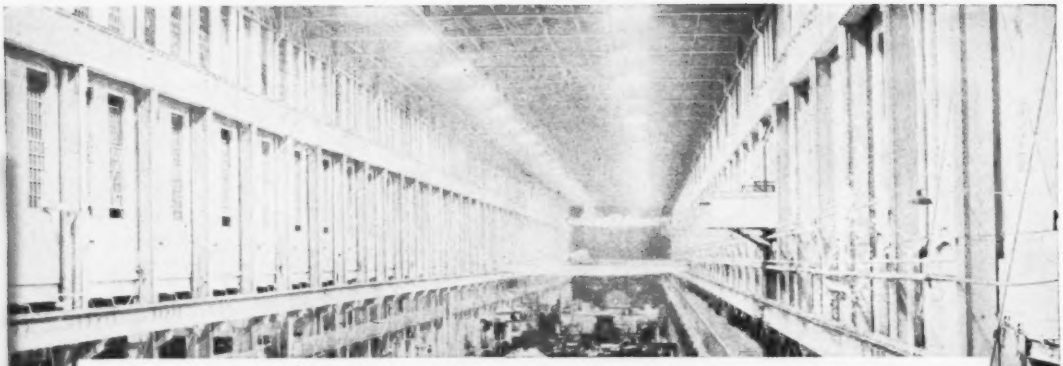
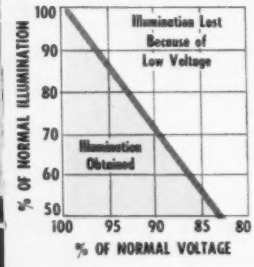
Chicago 40, Illinois
☐ Please send complete information on ..... 7.5 kv, ... 15 kv, ... 23 kv, ... 34.5 kv Alduti Interrupter Switches
☐ Have representative call
Name .....
Company ..... Title .....
Street & Number .....
City ..... Zone ..... State .....

Allis-Chalmers

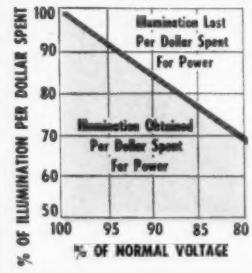
STOP Wasted



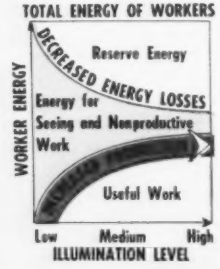
HOW UNDERVOLTAGE WASTES MAN-HOURS . . . CUTS PRODUCTION



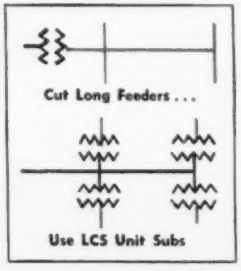
GOOD ILLUMINATION demands that rated voltage be maintained to all lighting fixtures. Illumination falls off rapidly on undervoltage . . . light output of filament bulbs is cut in half when voltage falls about 17%. Poor lighting causes eye strain . . . slows down workers . . . makes inspection difficult . . . causes increased scrap.



YOU PAY for illumination you don't get when you operate your distribution system at undervoltage. For example: at 10% undervoltage, illumination is cut 30% but power consumption is cut only 15%. Eliminate this power waste . . . get all the power you pay for by maintaining full voltage to all lighting fixtures.



MORE ENERGY AND TIME for useful work results from quicker seeing in well illuminated plants. In one case illumination was increased from 6 to 16 ft. candles (an increase from 83% to full voltage) . . . resulting in a 9% increase in production—20% decrease in accidents. Again, production increased 25% with an increase from 6.8 to 24.5 ft. candles.



A MAJOR CAUSE of undervoltage is the voltage drop in secondary feeders. Long lines of heavy copper carrying power at low voltage may prove inadequate as production schedules are stepped-up and new machines added. Install Allis-Chalmers LCS Substations at load centers to cut feeder length, reduce voltage drop and increase production.

Unit Substations

Manhours!

By Improving Illumination

BOTH MACHINERY AND PERSONNEL gain efficiency when you install unit substations to correct undervoltage. That's because no worker can do his best *unless* his job is well lighted . . . no electrical equipment gives top performance *unless* it operates at proper voltage.

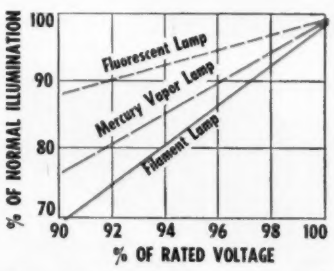
Filament bulbs, for instance, give 15% less than rated light when voltage falls only 5%. On undervoltage, fluorescent tubes and mercury lamps give less than rated light, are difficult to start, may flicker and go out. And when you operate at undervoltage, you are paying for power you're not using.

Eliminate power waste . . . manhour loss. Workers are more efficient, produce more work of better quality when illumination is adequate. Put *all* the power and manhours you're buying to work by maintaining proper voltage to all equipment. Install Allis-Chalmers LCS Unit Substations at load centers and eliminate long runs of expensive low voltage cable. Allis-Chalmers LCS Load Center Unit Substations are neat, compact, easy to install and provide protection to personnel.

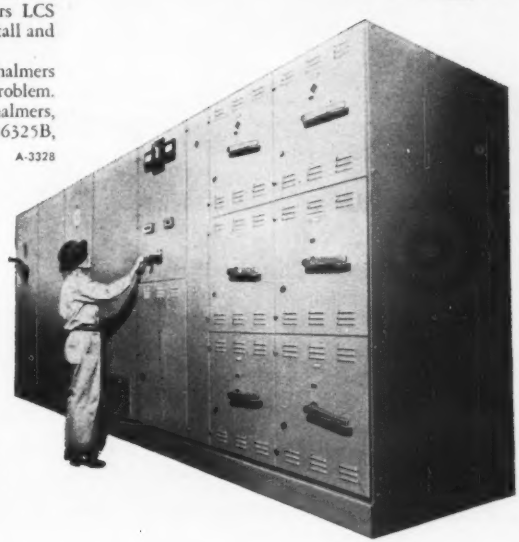
You can count on the cooperation of experienced Allis-Chalmers substation engineers in working out your distribution problem. Get in touch with your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for bulletins 11B6285A, 11B6325B, and 11B6895.

A-3328

LCS
LOAD CENTER
Unit Substations



Undervoltage reduces the light output of filament, fluorescent and mercury vapor lamps. Although light output is least affected on fluorescent lamps, undervoltage makes them flicker, hard to start. Mercury lamps go out altogether at 10% undervoltage . . . require up to 20 minutes to regain full light output.

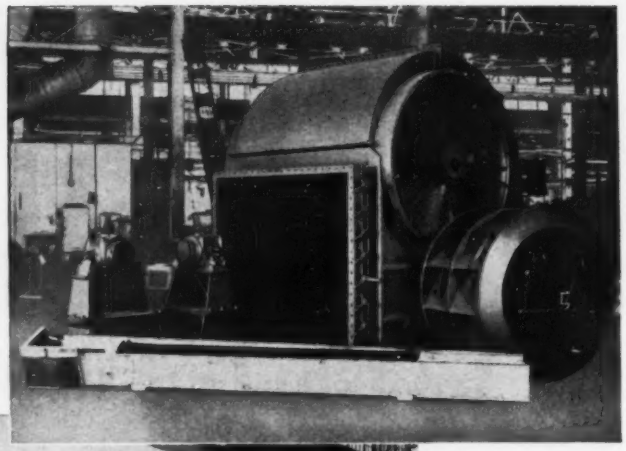


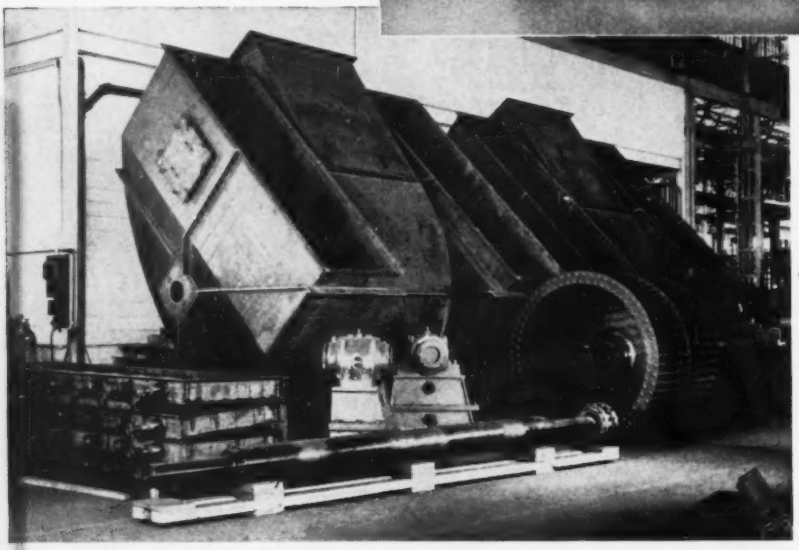
ALLIS-CHALMERS

You'll improve over-all power plant efficiency with

AMERICAN BLOWER MECHANICAL DRAFT FANS

To keep progress with ever-increasing demands for electrical horsepower, America's great public utilities are constantly expanding their plants and facilities and extending the scope of their services.





Above is shown an American Blower Forced Draft Fan with component parts, prior to shipment to one of America's leading public utilities. This fan is rated at 180,000 CFM at 100° at 18.2" static pressure.

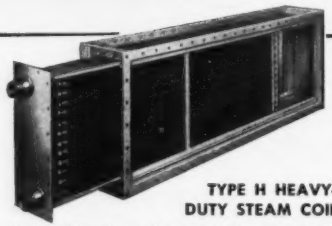
The photograph at left shows two American Blower Induced Draft Fans with component parts. Each has a capacity of 313,000 CFM at 420° at 10.1" static pressure. Sirocco Induced Draft Fans, with die-formed forward curved wheel blades are designed and proportioned specially for induced draft work and are now used on 1,000,000#/hr. steam boilers.

That a vast majority of these utilities depend on us for important equipment, is a tribute to the fine performance of American Blower Products as well as to the engineering skill available through our strategically located branch offices.

May we serve you?

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation



TYPE H HEAVY-DUTY STEAM COIL

Designed for heavy loads at high pressures. It is corrosion-resistant, easy to maintain, and is completely accessible.

YOUR BEST BUY AMERICAN BLOWER POWER PLANT EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

This Tap Changer Story began

20 YEARS ago . . .

Straight Line FACTS

Purchasers of transformers are extremely interested in tap changer design because the failure of a tap changer can cause the failure of a transformer.

Twenty years ago Pennsylvaina Transformer Company developed the Straight-Line Tap Changer and began using it in all Power Transformers. Succeeding years brought modifications and improvements but, in essence, the present Straight-Line Tap Changer is the same as the one introduced in 1930.

For twenty years the Straight-Line Tap Changer has functioned in all types of Power Transformers under all operating conditions.

Not once in all this time has there been any reason to question the fundamental principles of the Straight-Line design.

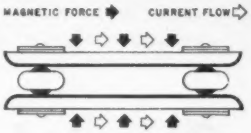
The performance record of the Straight-Line Tap Changer is adding to the reputation of Pennsylvania Transformers. It is one of the reasons for the confidence put in Pennsylvania by a growing number of leading Utilities that are placing important orders for Pennsylvania Transformers.

1. Flexible steel spring construction and straight line motion of movable jaw assures a self-aligning, high pressure contact at all times.

2. All contacts made of a time-tested silver-nickel mixture which possesses the electrical qualities of silver but is inert to chemical reactions. Contacts are pressure and temperature treated for high conductivity and high resistance to wear.

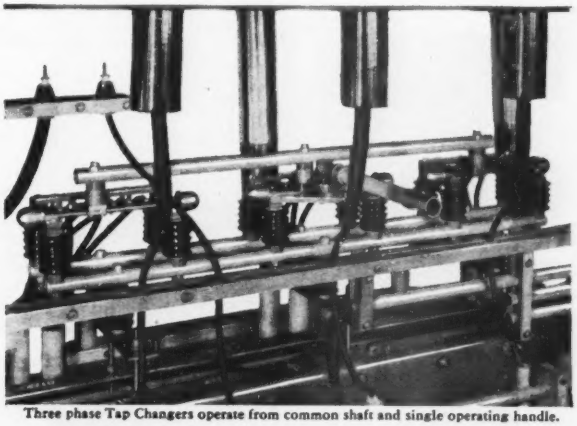
3. Contacts are self-cleaning. Each operation of tap changer results in a positive wiping action.

4. Straight Line Tap Changer withstands dead short circuits. Design of Tap Changer is such that magnetic forces cause moving contacts to increase pressure during short circuits. There is no blow-off action.



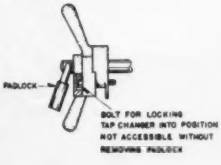
5. Transformer cable leads crimped to ends of stationary jaws. Crimping provides a high quality mechanical and electrical connection without possibility of crystallization due to brazing.

6. Tap Changer located in top section of tank — above core and coils — where it is accessible through handholes or manholes for simplified inspection and maintenance.



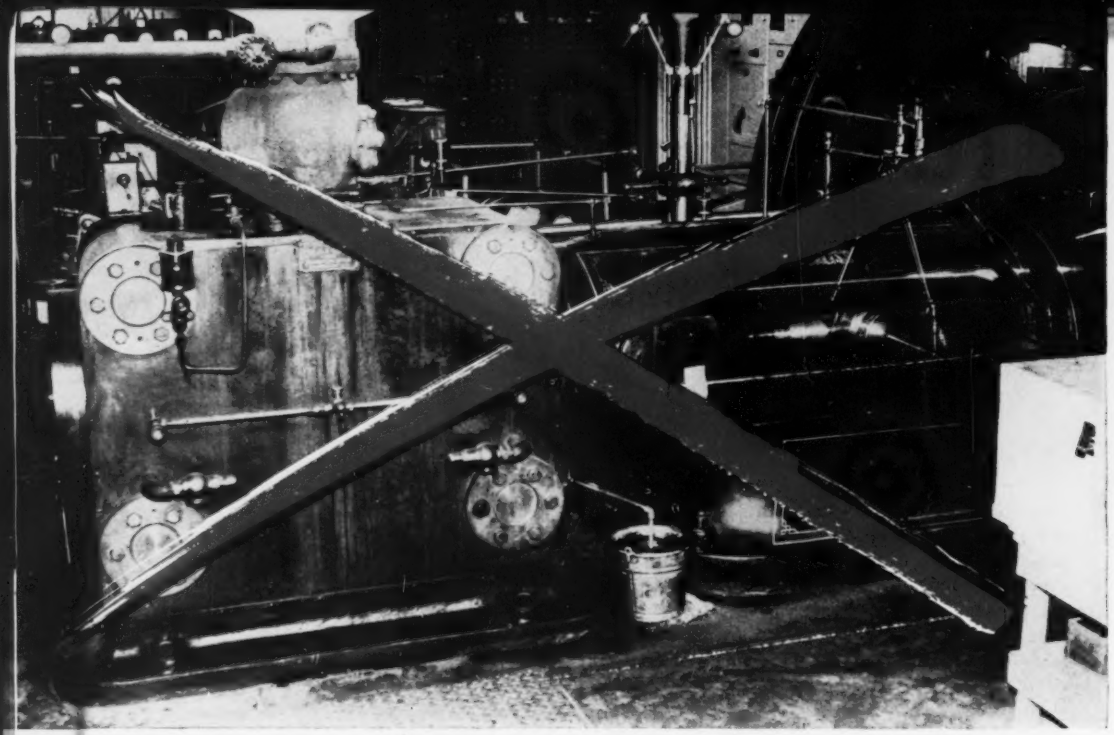
Three phase Tap Changers operate from common shaft and single operating handle.

Operating handle issues through side of case and is provided with a positive locking mechanism.

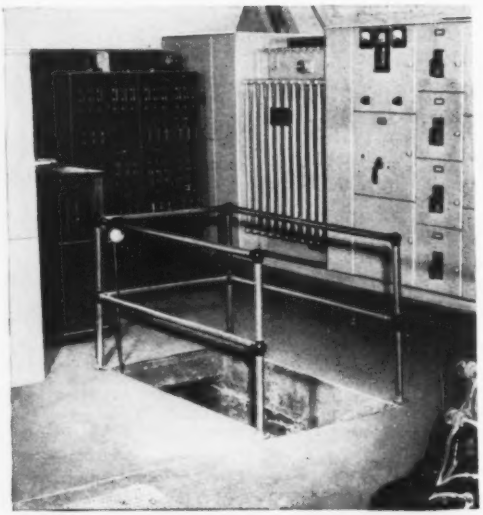


Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PENNA. • Greater Pittsburgh District



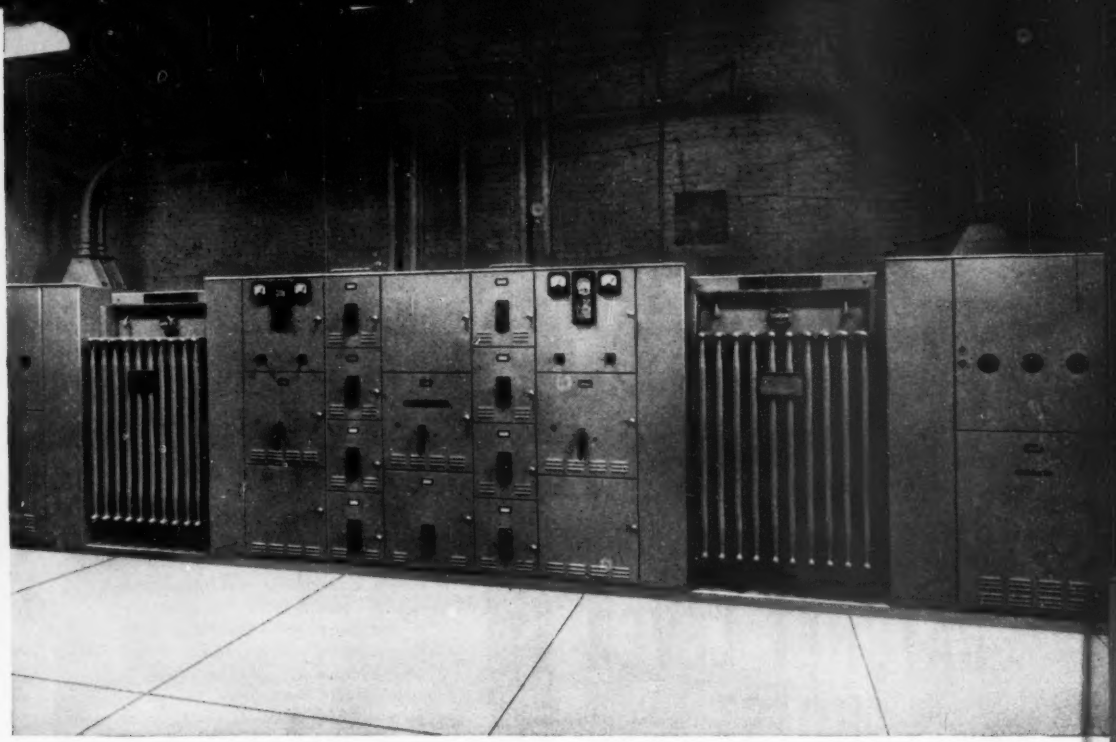
Obsolete power supply completely



G-E LOAD CENTER UNIT SUBSTATION was installed without interruption of the plant's power. Sectionalized design permitted the two-step operation in which the generator's load was thrown on one transformer before the steam engine and generator were removed.

THE STEAM-DRIVEN GENERATOR pictured above supplied much of the power used by the Illinois Cabinet Company. Rated at 500 kva, it was severely overloaded much of the time. Failures of steam, engine and generator resulted in costly shutdowns.

The company could have saved $9500 in power costs if it had been purchasing the power it generated in 1947 and 1948. In addition, it would have avoided the expense of handling 56 carloads of coal.



replaced without plant shutdown!

G-E load center system saves Illinois Cabinet Company $4500 annually—simplifies future expansion

Plagued by costly power failures and poor voltage conditions, the Illinois Cabinet Company, Rockford, Illinois, called in the General Electric Company for a complete remodeling of its power system.

In place of the old 500-kva, 240-v steam-driven generator, G-E engineers suggested a 1000-kva load center unit substation and the purchase of *all power from the local utility.* In addition, they proposed a new feeder system to simplify the existing circuits, reducing voltage drop and copper losses. Calculations showed that power costs could be cut by $4500 annually.

To minimize lost production time, the double-ended load-center unit was installed in two sections since it could not be completely assembled until the old steam engine was removed. After the first section was installed, the generator's load was thrown on the new transformer. Then the steam engine and generator were removed and the second section was fitted into place. In two week-ends the transformation was complete.

You, too, can get a power distribution system adapted to today's constantly changing production picture. See your G-E sales representative, or write for Bulletin GEA-3592 Load Center Unit Substations and GEA-5600 "Electric Power for Industry's Third and Biggest Expansion." General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

321-79

introducing

the Coffing COIL CHAIN SAFETY-PULL RATCHET LEVER HOIST

Here is a completely new ratchet lever hoist designed to bring you added safety and convenience. The Model R incorporates the time-proved ratchet and pawl principle originated by Coffing — makes it hold positively at all times — no friction-type brake to slip or freeze — chain is free wheeling when not under load.

Advanced Guard for a New, Advanced Line

The Model R is now available in 1,500- and 3,000-lb. capacities — other sizes will follow.

Many New Advantages

COIL CHAIN Swings or wraps in any direction for greater flexibility in use.

SIX OPERATING POSITIONS Handle operates in any position, works on full or partial strokes — for ease of handling in close quarters. Safety stops prevent spinning of handle.

SAFETY FACTOR OF FIVE All hoist load-holding parts designed to withstand pull equal to five times rated capacity. Each hoist also factory tested at 100 percent overload. "Safety-valve" handle bends at point of maximum safe overload.

SIMPLE TO SERVICE The Model R may be completely disassembled with only a screwdriver for easy servicing. Not necessary to return it to the factory for repairs.

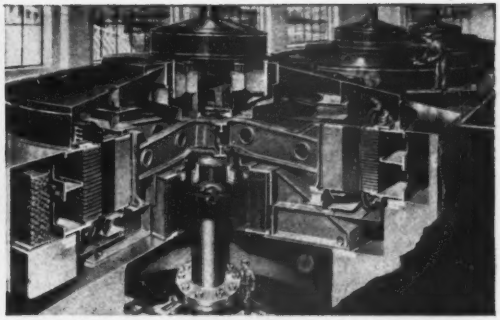
Find out more about the hoist that gives you greater convenience and safety in all lifting, pulling, stretching. Write for Bulletin E10R.

COFFING HOIST Company
Danville, Illinois

Quik-Lift Electric Hoists • Hoist-Alls • Mighty-Midget Pullers
Spur-Geared Hoists • Differential Chain Hoists • Load Binders
I-Beam Trolleys

Sold by Industrial Distributors everywhere

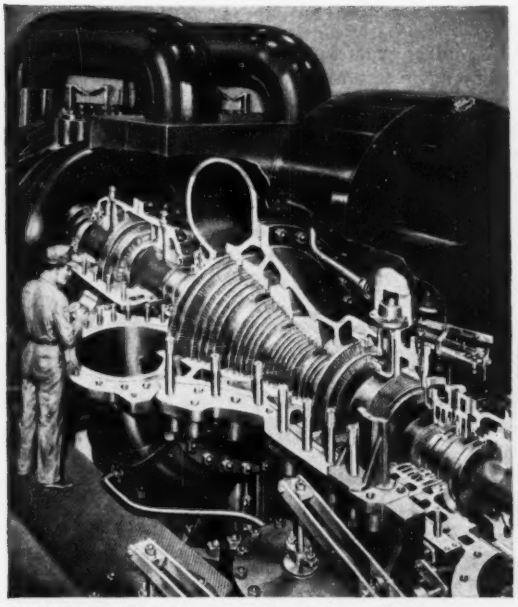
GAS TURBINES—only recently put to industrial use—are proving highly efficient. Socony-Vacuum aided in their development—lubricates the first gas-fired and first coal-fired turbines placed in operation.



HYDRAULIC GIANTS—of type shown—have rotating parts with combined weight and thrust of 250 tons! Microscopically thin films of a famous Gargoyle oil protect these vital parts against damage and wear!

FIRST IN TURBINES

with the Biggest, the Most, the Latest!



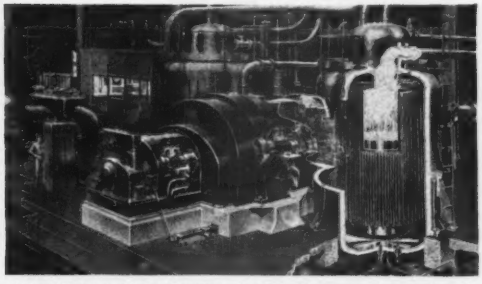
STEAM TURBINES—from the smallest to the world's biggest—are charged with famous Gargoyle oils. In fact, more turbines of 5,000 KW and over are lubricated by Socony-Vacuum than by any other oil company!

Why Accept Anything Less?

Among the many claims made for various turbine oils, one *fact* stands out . . . more turbines of 5,000 KW or larger are lubricated by Socony-Vacuum than by any other oil company! Here's why—

Famous Gargoyle D.T.E. oils are top quality—backed by 85 years of lubrication experience. They protect fully over unusually long periods, give extra long service life, help turbines run more continuously with less need for maintenance.

Why accept anything less for *your* turbines?



MERCURY-STEAM POWER PLANT—first ever designed and coordinated as a unit station—combines two 7,500-KW mercury turbines with a 25,000-KW steam turbine. The entire unit is 100% Gargoyle-lubricated!

SOCONY-VACUUM OIL CO., INC.
and Affiliates:
MAGNOLIA PETROLEUM CO.
GENERAL PETROLEUM CORP.

SOCONY-VACUUM
GARGOYLE
Lubricants

SOCONY-VACUUM
Correct Lubrication

WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE

NEW UTILITY STATIONS C-E EQUIPPED

Includes stations placed in operation since the war (in white) and those under construction or being engineered.

NEW

Florida's rapidly expanding electric power facilities were stepped up again recently when the new Palatka Steam Electric Generating Station of the Florida Power & Light Company was placed in service. First turbine-generator to go on the line is a preferred standard unit of 30,000/33,000 kw rating with an anticipated capability of 35,000 kw.

Located on the picturesque St. Johns River near the growing industrial center of Palatka, Florida, this fine, modern station is designed to accommodate additional units as may be required by increase in population and industry in this area.

Palatka, the fourth new power station brought into service by the Florida Power & Light Company since VJ Day, is the newest link in one of the fastest growing power systems in the country. The Company has already doubled its pre-war generating capacity and new plants under construction will triple it by 1953.

Ebasco Services, Inc., are the Designing Engineers and supervised construction of the Palatka Station.

The generating unit is served by a C-E Steam Generator, a cross-sectional elevation and brief description of which will be found on the opposite page. B-520

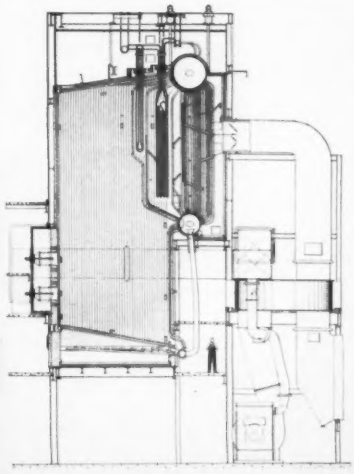
C-E

COMBUSTION

200 MADISON AVENUE, NEW YORK 16, N. Y.

Palatka Station goes into service

The cross-sectional elevation at the right shows the C-E Unit that recently went into service at the Palatka Station. It is a VU-50 Steam Generator of the outdoor type with 2-stage superheater and has a regenerative type air heater following the convection surface. This unit is designed for oil firing but is arranged for easy conversion to pulverized coal when and if desired. Maximum continuous capacity is 350,000 lb of steam per hr at 920 psi and 905 F.



ENGINEERING—SUPERHEATER, INC.

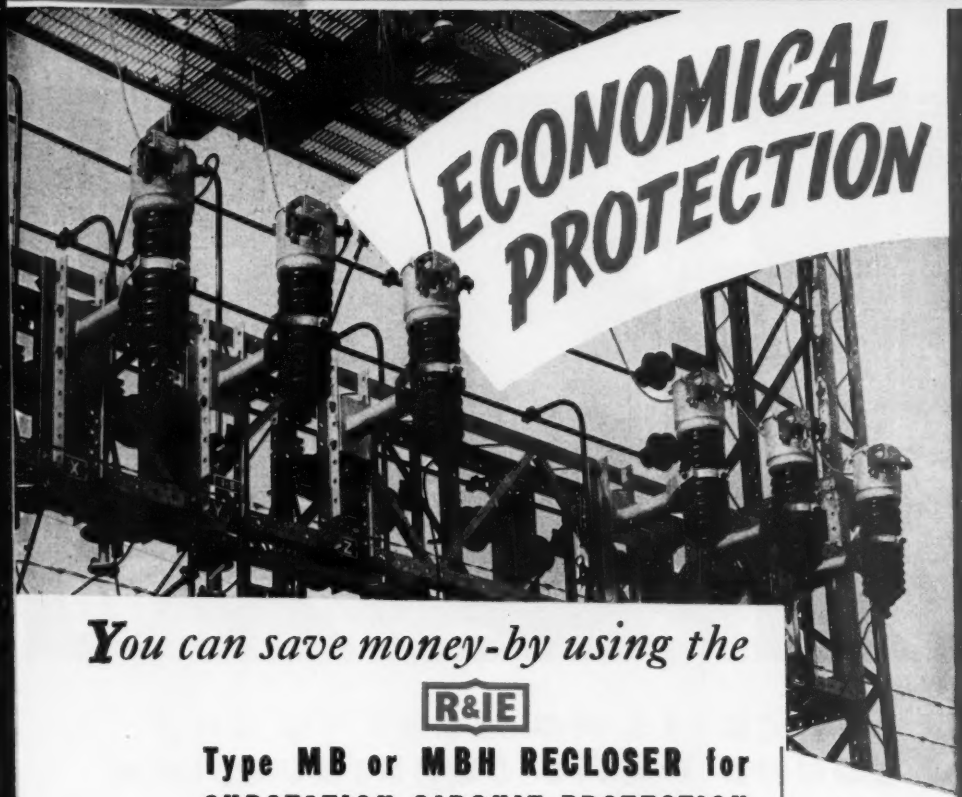
ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

Double-barreled value! The long life plus the extra brightness of Westinghouse fluorescent lamps can't be beat

Take advantage of real savings in money and maintenance! In the office or factory, these lamps deliver unsurpassed performance. And now at *new low net* prices—on quantity purchases. Lamp Div., Westinghouse Electric Corporation, Bloomfield, N. J.

YOU CAN BE SURE...IF IT'S

Westinghouse



ECONOMICAL PROTECTION

You can save money-by using the

R&IE

Type MB or MBH RECLOSER for SUBSTATION CIRCUIT PROTECTION

R&IE AUTOMATIC CIRCUIT RECLOSER brings transmission type of service-restoration to distribution centers.

CHECK the FACTS

1. Reduces service costs by preventing unnecessary fuse blowing.
2. Provides full protection to wires and equipment.
3. Greater accuracy through mechanical timing—free from temperature error.
4. Coordinates with (several) secondary fuses.
5. Permits normal fusing for selective clearing of overloads and short circuits.
6. Selects with substation overcurrent relays.
7. Handles high load currents—up to 250 amperes.
8. Provides high interrupting capacity up to 6000 Amps.

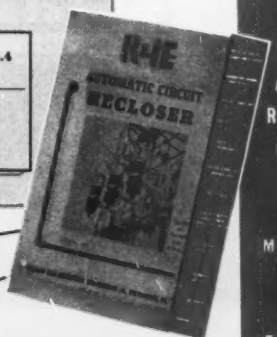
TYPE MB AND MBH INTERRUPTING RATINGS

Type MB

Continuous Duty Rating of the Recloser in Amperes	2.1—4.16 Kv	4.8 Kv	6.9—8.32 Kv	12.0—14.4 Kv
60	2000	1500	1500	1500
100	3000	2500	2500	2000
140	5000	4000	4000	2000
200	6000	5000	4000	2000
250	6000	5000	4000	2000

Type MBH

Full data on Type MB and the new Type MBH—Bulletin 1371



RAILWAY and INDUSTRIAL ENGINEERING CO. Greensburg, Pa.

IN CANADA—EASTERN POWER DEVICES LIMITED, TORONTO

The Check List

- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- HORN GAP SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- DISTRIBUTION EQUIPMENT
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC RECLOSING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

IT COSTS NO MORE TO BUY SOUND BASIC CONSTRUCTION

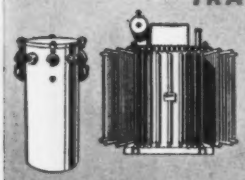
● Today, at The Standard Transformer Company, top-quality transformers are being produced for distribution systems all over the world — with no sacrifice of material for the sake of unimportant claims.

● Examine the Distribution Transformers illustrated on the right-hand page. Notice the easily removable cover, moisture-proofed with a Neoprene gasket to prevent oil leakage . . . note the rugged copper-bearing steel tank housing a low-loss core assembly of non-aging, varnish coated, silicon steel sheets . . . a coil that is wound in two sections to double heat radiation . . . ends that are not blanketed to induce free and effective oil circulation . . . a well-designed core clamping that assures quiet and efficient operation. These are some of the features that make Standard Transformers the best in their field.

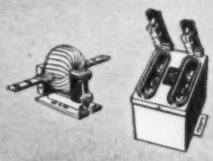
● It pays to buy sound basic construction. When you need transformer information, write for the name of your nearby Standard representative. He will help you with your selection, and describe our service fully.

. . . and remember . . . The Standard Transformer Company has built its reputation as a specialist in the design of transformers for every need. ● You write the ticket . . . Standard engineers and craftsmen comply with your specifications or requirements. You have complete freedom in your choice of accessories, such as Cubicles or Switchgear for Load Center or Substation Transformers, or other types that require them.

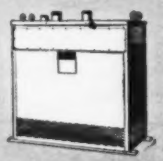
TRANSFORMERS FOR EVERY APPLICATION



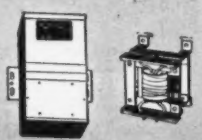
Liquid filled (sizes up to 10,000 KVA and 72 KV inc.)



Instrument transformers (for use on circuits up to 72,000 volts, inc.)



Dry type (up to 1000 KVA and max. voltage ratings of 4800)



Control transformers (compound filled or open type)

Standard

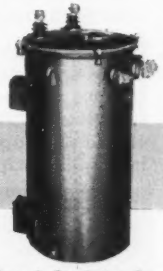
TRADE MARK ®

DISTRIBUTION TRANSFORMERS

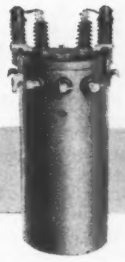
● Shown here are seven liquid filled Distribution Transformers 7½ to 75 KVA. Standard manufactures a complete scale of Transformers up to 15,000 KVA.

Type A Distribution Transformer, single phase, 60-cycle, sizes through 7½ KVA, voltage 2400/4160Y to 120/240, with pocket mounted, high voltage bushings.

Type A Distribution Transformer, single phase, 60-cycle, sizes of 10 and 15 KVA, voltage 2400/4160Y to 120/240 or 240/480, with pocket mounted, high voltage bushings

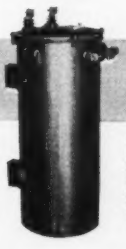


Type A Distribution Transformer, 37½ KVA, 2400/4160Y to 120/240 volts, single phase, 60-cycle, with cover mounted high voltage bushings.

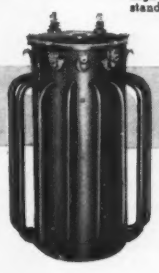


Type CSP (completely self-protected) Distribution Transformer, 15 KVA, 7200/12470Y to 120/240 volts, 60-cycle, single phase with cover type high voltage bushings ASA standard

Type CSP (completely self-protected) Distribution Transformer, 15 KVA, 2400/4160Y to 120/240 volts, 60-cycle, single phase with two pocket type high voltage bushings ASA standard



Type A Distribution Transformer, 50 KVA, 2400/4160Y to 120/240 volts, single phase, 60-cycle, with cover mounted high voltage bushings



Type A Distribution Transformer, 75 KVA, 2400/4160Y to 120/240 volts, single phase, 60-cycle, with cover mounted high voltage bushings.

Write for Bulletins covering the complete Standard line.

THE STANDARD TRANSFORMER CO.

WARREN • • • OHIO

(REPRESENTATIVES IN PRINCIPAL CITIES)

EVAPORATORS or DEMINERALIZERS

COCHRANE PRESENTS SOME INTERESTING DATA FOR THE OPERATORS OF PUBLIC UTILITY BOILER PLANTS

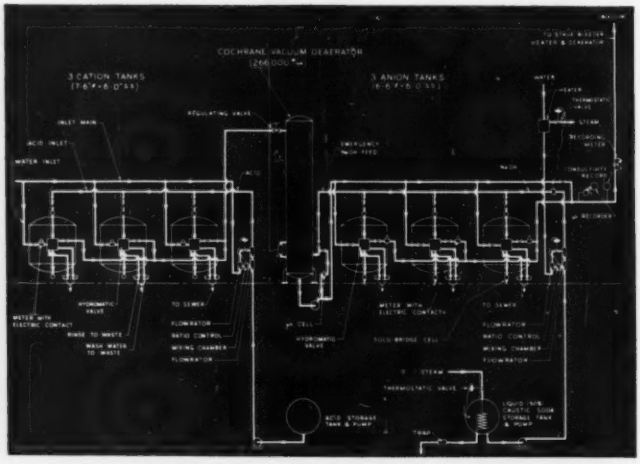
The adoption by a number of central power plants, of Demineralizers for treatment of boiler feedwater in place of evaporators, has aroused great interest on the part of utility operators everywhere. Cochrane Corporation has made a study of the subject and has some interesting facts which will bear examination.

ADVANTAGES OF DEMINERALIZING:

1. **Full makeup supply available continuously.** With evaporators the available capacity varies with the turbine load. Demineralizers can produce full desired makeup capacity irrespective of turbine load.
2. **Greater economy in overall station efficiency** with Demineralizers because no heat is used in producing demineralized water and no loss of power suffered by degradation of steam.
3. **Better quality makeup water.** Demineralized water has higher pH values than distilled water produced from an evaporator with CO_2 present in the vapor. Carry-over problem, common to evaporators, is eliminated. Total solids of actual demineralized water lower than usual actual distilled water.
4. **Lower maintenance costs.** Corrosion in vapor and distillate lines avoided by Demineralizing.
5. **Lower labor costs.** Demineralizers can be made automatic.
6. **Greater flexibility of heat balance.** Frequently the heat balance must be changed due to increasing steam demands on plant. Evaporators interfere with such drastic heat balance changes. Demineralizers permit greatest flexibility.

Write for these papers:

Experiences with Silica Removal Demineralizers.—Paper presented Midwest Power Conference, April, 1951. Evaporation vs. Demineralizing and Silica Removal. A discussion at Engineering Society of Western Penna., October, 1950.



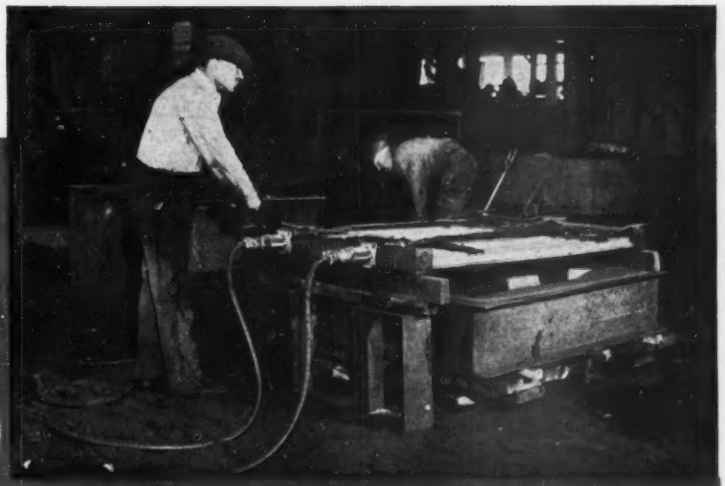
COCHRANE CORPORATION • 3146 **N. 17th St.** • **Philadelphia 32, Pa.**

In Canada: Canadian General Electric Co., Ltd., Toronto • In Mexico: Babcock & Wilcox de Mexico, S. A., Mexico City • In Europe: Recuperation Thermique & Epuration, Paris

COCHRANE

PIONEERS AND LEADERS IN BOILER FEED, PROCESS & INDUSTRIAL WATER CONDITIONING
COCHRANE CORPORATION
88th
YEAR OF SERVICE
1863 - 1951

TIREX HELPS TAKE THE BUBBLES OUT OF STEEL CASTINGS



Foundries "skin dry" molds so that the molding sand will not give off a gas and cause bubbles or porosity in the casting.

Until a short time ago it was common practice in most foundries to skin dry molds with an open kerosene torch. It was slow, hot, dirty, disagreeable work and a moment's inattention could result in a burned and spoiled mold.

A Milwaukee foundry decided to get rid of this dirty, slow job of skin drying molds. They had infrared ray heaters developed. These heaters not only did away with the drudgery of the job but gave the foundry several unexpected dividends. First, the labor of the man drying the mold was eliminated. Second, spoiled molds became a thing of the past. But better still, because the infrared ray heaters were faster than the open kerosene torches, it was possible to dry an additional mold each day and that is a considerable dividend.

Of course the infrared ray heaters demanded a dependable pathway for power and that they got in TIREX Cables. This picture shows TIREX Cables connected to the heaters. TIREX not only operates dependably day in and day out but it safely combats the sharp abrasive foundry sand, it eliminates the danger from cable fires caused by flying molten metal sparks, and it takes in its stride the everyday abuse that is part of the job.

Isn't that the kind of service that you want from your portable cords or cables? Of course it is! This kind of service was deliberately built into TIREX Cords and Cables. They are a product of Simplex research.

Simplex research gave you the first heavy duty, rubber-jacketed portable cord or cable; the first low water absorption insulation; the first rubber-jacketed underground cable. Besides these notable "Firsts" Simplex research has provided a great many developments which have enriched the art of cable design.

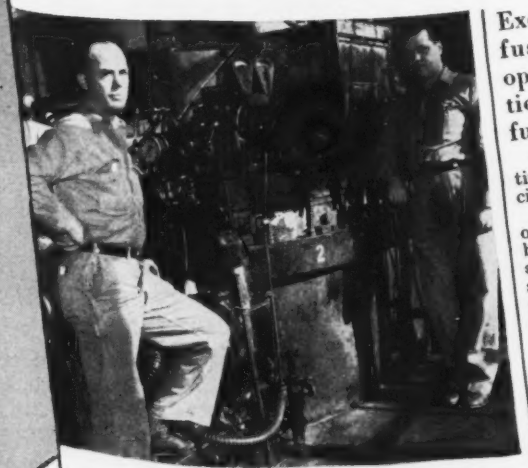
SIMPLEX-TIREX IS A PRODUCT OF SIMPLEX RESEARCH

SIMPLEX-TIREX

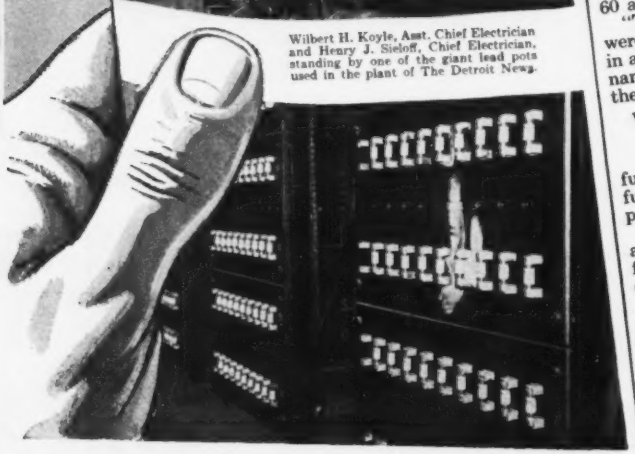
SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

The Detroit News
EWSPAPER FOR MORE THAN 77 YEARS
res Weekday and Sunday, of Any Michigan Newspaper

FUSE FAILURES ON LEAD POT CIRCUITS STOPPED COLD — BY CHANGING TO FUSETRON FUSES



Wilbert H. Koyle, Asst. Chief Electrician and Henry J. Sieloff, Chief Electrician, standing by one of the giant lead pots used in the plant of The Detroit News.



Excessive heating of ordinary fuses caused 3 to 4 fuses to open every week. Cooler operation of Fusetron dual-element fuses cured trouble completely

"Prior to May 20, 1950, we had a bad time keeping all the electric heating circuits on our lead pots in full operation.

"We have two eight-ton lead pots and one six-ton. Each is electrically heated by single phase, 220 volt, 10 kilowatt elements, fed from a 220 volt, 3 phase source. The circuits on each are protected by sixty 60 ampere and nine 400 ampere, 250 volt fuses.

FOUND 6 TO 8 FUSES BLOWN

"To be sure that all heating elements were operating properly, we used to check all 207 fuses about once in two weeks. Generally our maintenance electrician would find six to eight of the 60 ampere fuses open.

"This meant that our melting pots were not operating at full efficiency and in addition to this loss, our fuse maintenance and purchases were greater than they should be.

WITH FUSETRON FUSES NOT ONE OUTAGE

"As an experiment, we changed all fuses over to FUSETRON dual-element fuses of the same amperages as had been previously used.

"To date, March 9, 1951, or after about nine months of using Fusetron fuses, our records show that not one of them has failed.

"We attribute this remarkable result to the lower resistance of Fusetron fuses which allows them to operate at a cooler temperature than other fuses that we have used."

Henry Sieloff, Chief Electrician
The Detroit News, Detroit, Mich.

Fuses that Protect in 10 Ways now Available

Fusetron dual-element fuses offer user surprising advantages

1 *Protect against short circuits.

2 Protect against needless blows caused by harmless overloads.

3 Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.

4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.

5 Protect motors against burnout from overloading.

6 Protect motors against burnout due to single phasing.

7 Give DOUBLE burnout protection to large motors — without extra cost.

8 Make protection of small motors simple and inexspensive.

9 Protect against waste of space and money — permit use of proper size switches and panels.

10 Protect coils, transformers and solenoids against burnout.

*Fusetron Fuses have high interrupting capacity as shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

Details on the Fusetron dual-element Fuse

A fuse link combined with a thermal cut-out — the result, a fuse with tremendous time-lag and much less electrical resistance.

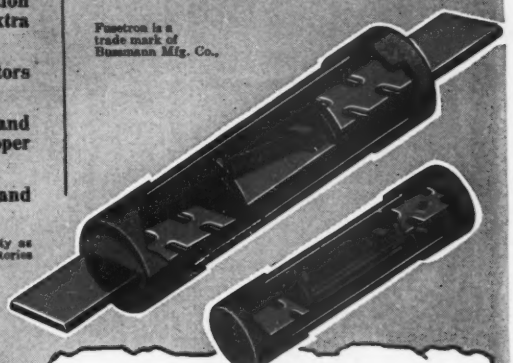
They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to same dimensions as ordinary fuses, FUSETRON Fuses fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

Fusetron is a trade mark of Bussmann Mfg. Co.



Don't risk losses in your plant!

One **needless** shut-down,
One **lost** motor,
One **destroyed** panel or switch,
One **burned out** solenoid . . .
May cost you more than replacing every ordinary fuse with a FUSETRON dual-element fuse.

Bussmann Mfg. Co.,
University at Jefferson, St. Louis 7, Mo.
(Division of McGraw Electric Co.)

Please send me complete facts about FUSETRON dual-element Fuses.

Name.....

Title.....

Company.....

Address.....

City.....State.....1051

Demand proof OF PERFORMANCE

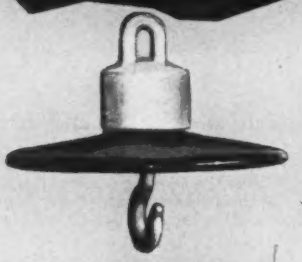


FIG. 1—In 1907, THOMAS was FIRST with the CAP-AND-PIN Suspension Insulator.

FIG. 2—In 1951, THOMAS is STILL the Standard of Comparison.

All insulators are not alike. To make an insulator that will do its job the trouble-free way . . . year in and year out . . . requires years of EXPERIENCE. Let's consider the Suspension Insulator as an example.

In 1907, Thomas made the first Cap-and-Pin Insulator. 10,000 units were installed that year in Central California. AFTER 44 YEARS OF CONTINUOUS SERVICE, THESE INSULATORS ARE STILL OPERATING SATISFACTORILY. Ask any other Insulator Manufacturer to support an equivalent statement.

Figure 1 shows this first Cap-and-Pin Insulator. Figure 2 is the 1951 model. Obviously, through the years, Thomas has constantly improved

SPECIFY THOMAS INSULATORS . . .

1873 THOMAS INSULATORS our 78th year RELIABILITY 1951

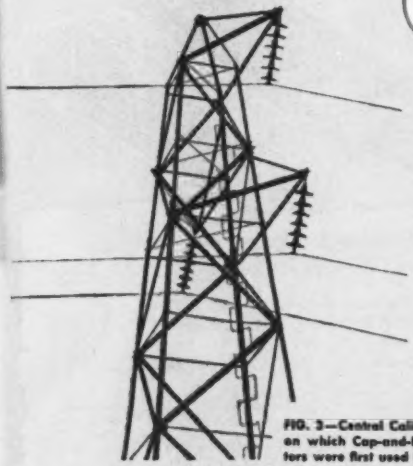


FIG. 3—Central California line on which Cap-and-Pin insulators were first used in 1907.

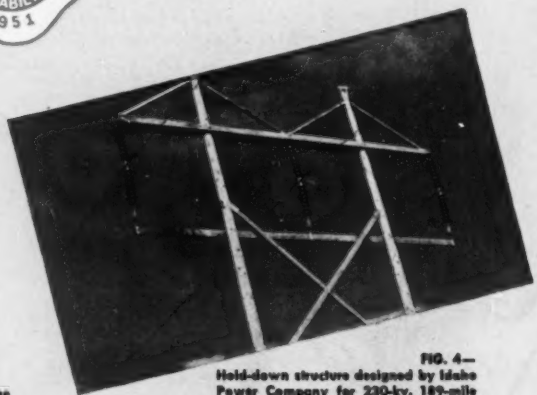


FIG. 4—Hold-down structure designed by Idaho Power Company for 230-kv, 189-mile line using 43,000 Thomas Insulators.

ENGINEERS, MANUFACTURERS AND DESIGNERS SINCE 1873

FOR SUPERIOR INSULATOR QUALITY

their design to maintain it as the Standard of Comparison.

After all is said . . . it's still quality that counts plus proper designing, precision manufacturing . . . and PROOF OF PERFORMANCE. Throughout the country, Thomas Insulators have been establishing service records since the advent of the Electrical Industry. Why gamble?

* * *

The R. Thomas and Sons Company is a manufacturer and designer of all types of porcelain insulators . . . pin-type, switch, suspension, spools, guy-strain, bushings and special high-voltage porcelain. In addition, Thomas supplies associated line hardware, clamps, fittings and so on.

. . . . THE BEST BY LINE TEST

FIG. 5—New 132-kv line of large Eastern Utility, a 35-year Customer of Thomas.

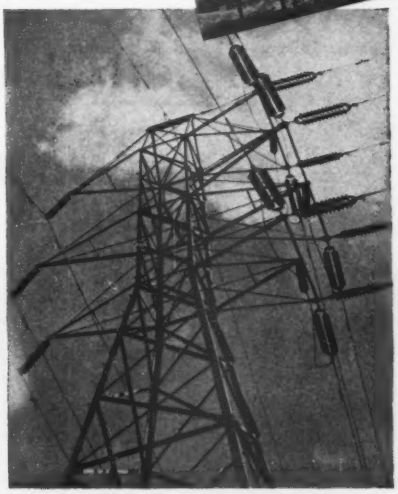


FIG. 6—New Mid-Western 132-kv Line. Naturally, Thomas Insulators were chosen for it.

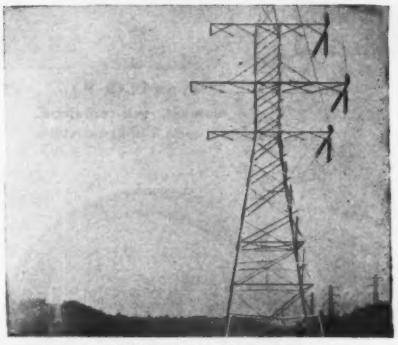


FIG. 8—2660-foot span of 69-mile, 132-kv line equipped with Thomas insulators installed in 1931.

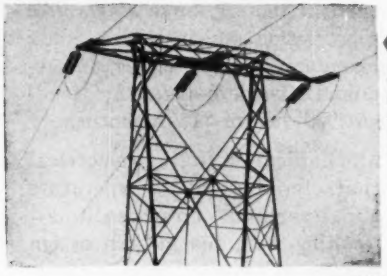


FIG. 7—Large Western 230-kv line using 50,000 Thomas Insulators installed in 1938.

The R. Thomas and Sons Co.

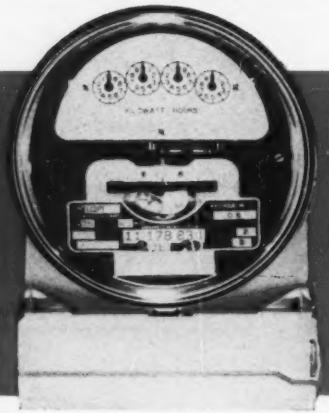
LISBON, OHIO

NEW YORK CHICAGO

Sales Representatives: E. B. Anderson Co., *Detroit* • Paul Berry, *Oklahoma City* • Ken H. Best, *Seattle* • Butler & Land, *Dallas* • R. E. Cunningham & Son, *Los Angeles* • Electric Supply Co., *Albuquerque* • Engineer Sales Corp., *St. Petersburg* • R. F. Hamilton & Associates, *Denver* • R. H. Harper, *St. Louis* • Geo. E. Henn Company, *San Francisco* • W. J. Hugo, *Minneapolis* • Leiser & Company, *Philadelphia* • Lynn Elliott Company, *Houston* • W. C. Milburn, *Chattanooga* • John G. Pettijohn Company, *Knoxville* • H. E. Ransford Co., *Pittsburgh* • Redmond Supply Co., *Phoenix* • J. F. Schaefer & Co., *Kansas City* • R. J. Sullivan & Company, *Boston* • Walter E. Thompson, *Birmingham* • E. E. Torkell, *Memphis* • Triangle Electric Supply Company, *El Paso* • United Electric Supply Co., *Salt Lake City* • Joe Williams, *Little Rock* • *Representatives in other principal cities*

* *You get* the advantages of Single Disk and Small Size in both 2 and 3 element

SANGAMO POLYPHASE METERS



Type LC-2-P
2 element, self-contained. For 3 wire, 3 phase circuits.

Type LC-3-P
3 element, self-contained. For 4 wire, 3 phase Y circuits.

* Only a minimum of space is necessary for mounting either 2-element or 3-element Sangamo polyphase watthour meters for power metering on all commercial and industrial applications.

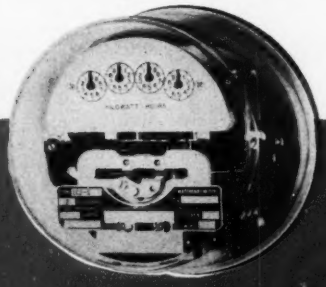
The complete Sangamo Type LC polyphase line, whether 2, 2½ or 3 element meters, have *single disk* construction which permits their manufacture in the *smaller* sizes required of modern meters for standard "A" "S" or "P" mountings.

Mechanical stability—electrical characteristics—full temperature and overload compensations—resulting from the modern design features of Type LC meters, assure dependable service and high accuracy of measurement over the entire load range up to 400% of meter rating.

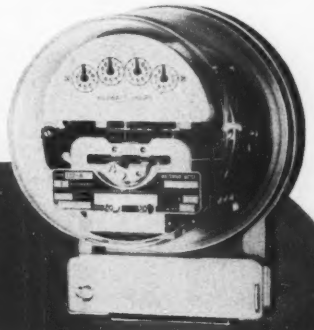
SANGAMO

Design features

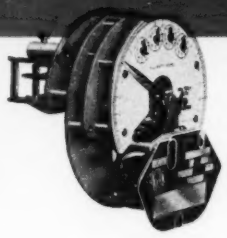
- ★ Driving element, moving system and register all mounted on one die-cast supporting grid, assuring permanent mechanical relation of all component parts.
- ★ Damping magnets of alnico are highly resistant to the demagnetizing effect of lightning surges and stray fields.
- ★ A basic constant of 0.6 watthours per disk revolution for each element, producing excellent inherent overload and voltage characteristics.
- ★ Service-proved oilless bearing system.
- ★ Generous design of copper in current coils provides high thermal capacity on overloads.
- ★ High insulation levels of potential and current elements. Also terminal insulation highly resistant to arc tracking.
- ★ Micrometer adjustments for full load, light load, power factor and element balance.
- ★ Easy accessibility of all parts for inspection and adjustment or replacement.



Type LC-2-S
2 element, self-contained,
Polyphase Watthour Meter.



Type LC-2-A
2 element, self-contained,
Polyphase Watthour Meter.



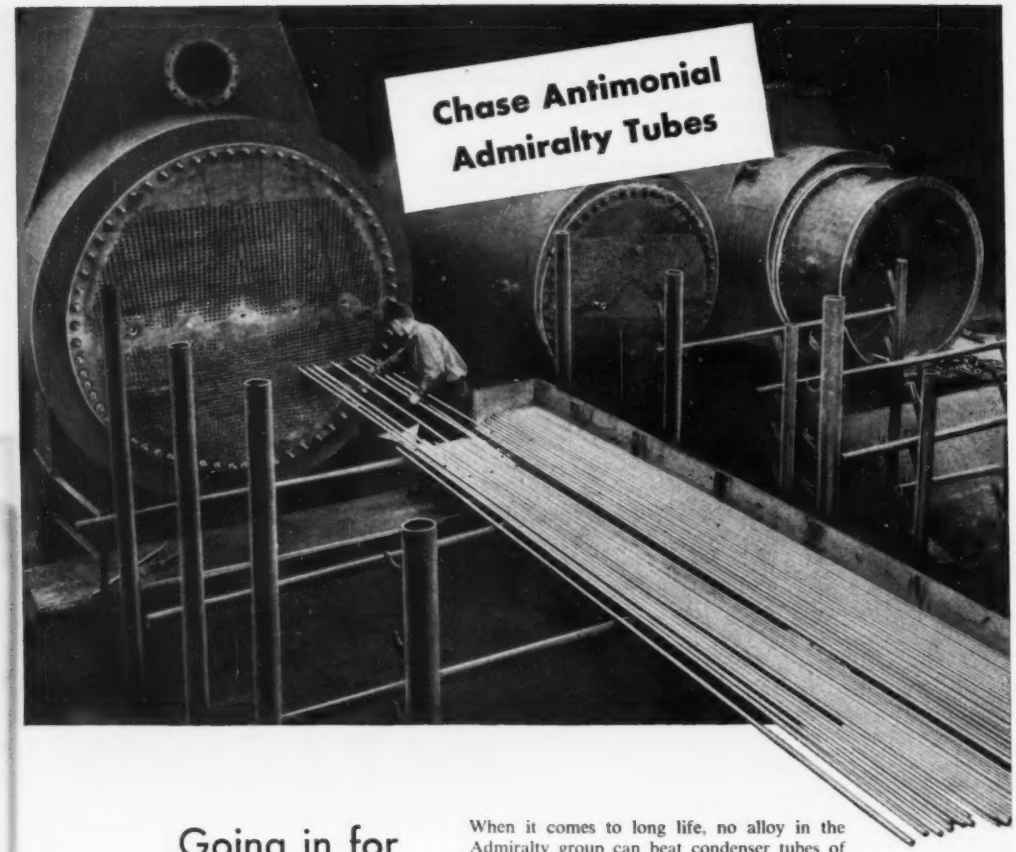
For convenient, dependable demand measurement on all polyphase circuits use Sangamo Type LCH demand registers on Type LC meters. These registers are timed by the new Sangamo low speed, high torque, hysteresis type motor, lubricated with a silicone of constant viscosity over wide temperature ranges. Years of troublefree operation are assured without expensive maintenance. Bulletin 321 gives complete information.

Write for Bulletin 240 for detailed information on LC Meters.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

EM51-6



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Because these tubes have *enough* antimony, they resist dezincification. And antimony as an inhibitor doesn't affect the grain structure . . . will not weaken the tube.

For more information about long-lasting Chase Antimonial Admiralty . . . send coupon for FREE book on Condenser and Heat Exchanger Tubes.

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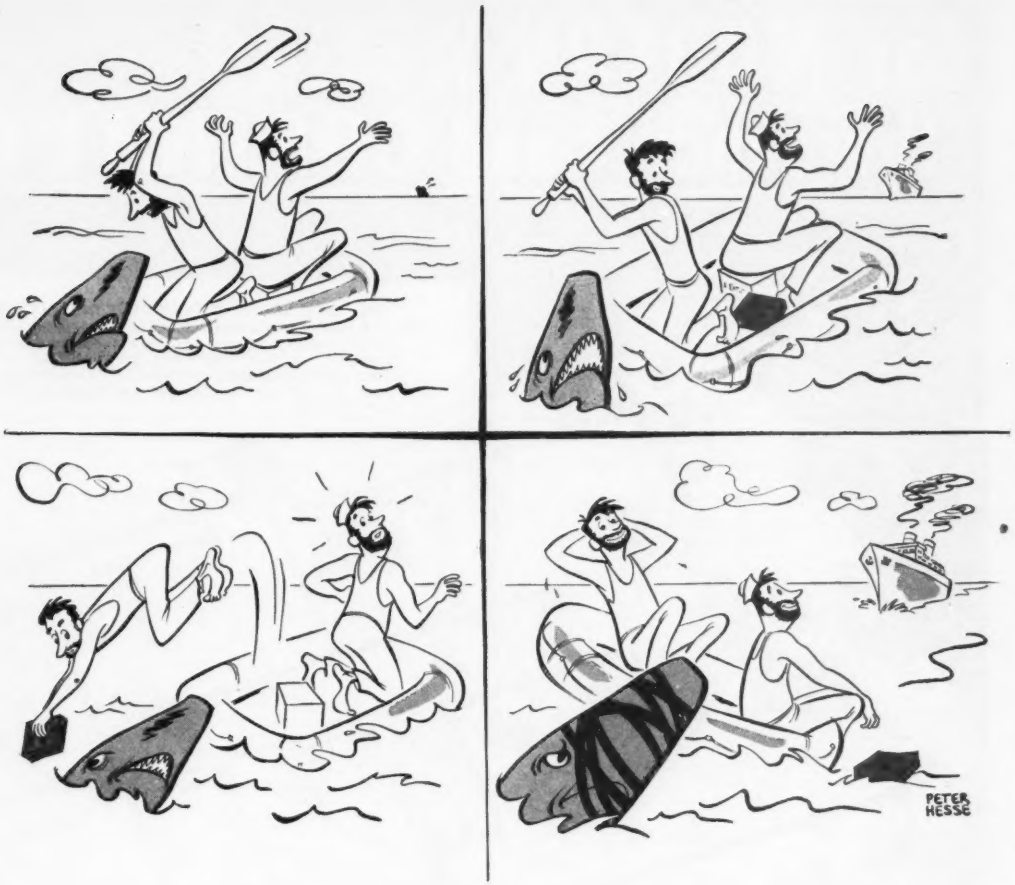
CHASE 75th



YOU CAN DO A LOT WITH A LITTLE JENKINS

Even under the worst conditions, Gold Seal tapes up tight. Electrical men say they can work faster with this tape because it stays "tacky", does not dry out or ravel. And that means more value; Gold Seal *goes further* since there's no waste. You can produce not only better-*taped* joints, but more joints per roll! No wonder it's the best buy in tape. Ask your supplier for Gold Seal, the *quality* tape made by Jenkins Bros. (Rubber Div.), 100 Park Ave., New York 17.

Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet both ASTM and Federal specifications.

Gold Seal Tape

FRICTION and RUBBER TAPES

TRADE JENKINS MARK Jenkins Bros

In either 10-roll cartons or single rolls. Every roll cellophane-wrapped.

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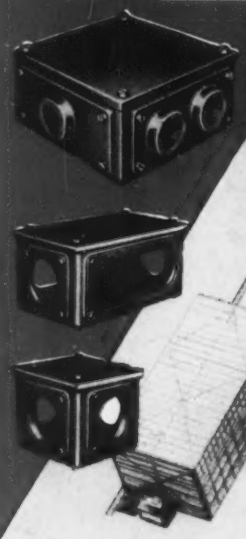
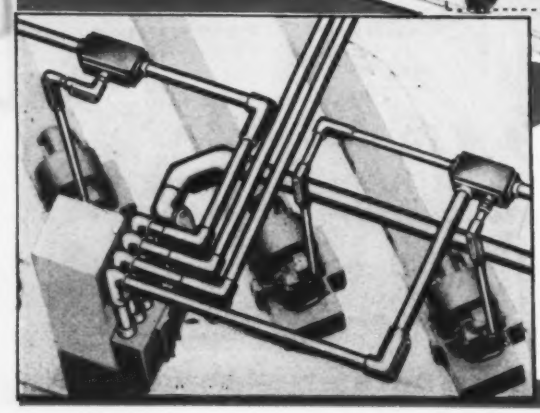
for MODERN WIRING... the conduit and CONDULET*



RS Series Junction Conduletes take detachable hub plates with 1, 2, or 3 hubs for conduit from ½" to 3/4"

THE "NEW LOOK" IN CONDULET INSTALLATION

A model of a screw machine department with a modern layout of cast Feraloy Conduletes and rigid conduit. It has flexibility plus all the other Condulet advantages. The actual installation has been in service for several years and is highly satisfactory.

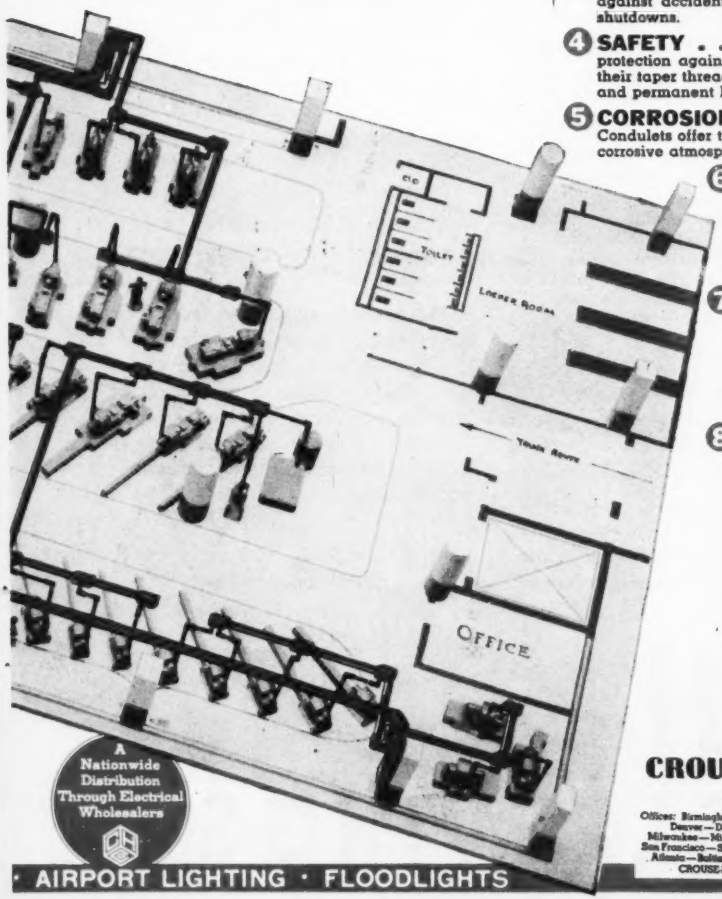


Enlarged view, showing how Type RSM Conduletes provide for easy expansion ... branch circuits can be added at any time. Simply replace a blank plate with a plate that has the required number and size of hubs.

CONDULETS · TRAFFIC SIGNALS ·

method gives YOU definite advantages!

NEW ways of using the familiar Condulet and conduit material have produced outstanding results. Modern installation layouts meet industry's modern needs for flexibility while retaining the enduring protection and safety that can only be given by cast Feraloy Condulets and rigid conduit.



1 FLEXIBILITY . . . A modern Condulet installation, like the one illustrated below, provides for the vigorous growth and changing conditions of a modern industry. The RS Series Condulets with their detachable hub plates make it easy to change circuits or add additional circuits at any time.

2 UNIVERSAL APPLICATION . . . Galvanized Condulets and galvanized rigid conduit may be used under all atmospheric conditions and occupancies.

3 MECHANICAL PROTECTION . . . Cast Feraloy Condulets and rigid conduit provide the best possible protection against accidental damage to the wiring — prevents costly shutdowns.

4 SAFETY . . . A Condulet installation gives maximum protection against personal injury and fires. Condulets with their taper threaded hubs and rigid conduit provide a reliable and permanent low resistance path to ground.

5 CORROSION RESISTING . . . Cast Feraloy Condulets offer the best protection wherever moisture, dust or corrosive atmospheres are present.

6 ECONOMY . . . Direct comparison of Condulet and rigid circuit installations with other wiring methods show comparable installed costs. The durability, safety, and low maintenance cost of Condulet installations produces savings which pay dividends over the years.

7 QUALITY . . . All Condulets are built to Crouse-Hinds' high standard of quality with painstaking care by skilled craftsmen. Thousands of Condulet installations that are still in active service after twenty, thirty, forty or more years offer positive proof that the trademark CONDULET stands for reliability and long life.

8 VARIETY . . . Thousands of types and sizes of Condulets, plugs and receptacles, and lighting fixtures are listed in the Condulet Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations. There is a Condulet for every purpose.

On your next electrical layout, whether modernization or new construction, plan to get all of the benefits of sturdy cast Feraloy Condulets and rigid conduit. Send for additional information on modern Condulet installation.

*CONDULET is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

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There you are, stretched out in perfect comfort. Feet up—pipe lit—a glass of the "brew that cheers" close by. You lean a little to the left, turn the knob, and your favorite program comes in. Just as the results from Santa Anita start — silence — then music and this announcement—"Due to circumstances beyond our control . . . " Only an annoyance to you, but a major concern to the broadcasting studio. You won't learn what happened, but the studio executives will make it their business to find out. Woe to the equipment manufacturer if it was just a vital piece of electrical insulation that hadn't been able to stand the gaff.

Electrical equipment is only as good as the insulation which protects it. Over 37,000,000 feet of BH Extra Flexible Fiberglas* Sleeving are safeguarding products of American industry. Heat, cold, age or vibration have little effect on BH Ex Flex (as it is known to the trade). Patented manufacturing processes make it non-fraying and non-raveling, even when cut in short lengths.

Flexibility is constant through a temperature range of -70° F to +1200° F, because no hardening varnish is used. The easy-to-handle tubular shape expands readily to cover knobs, terminals and irregular obstructions.

Tough and long lasting, BH Ex Flex is available in colors, with color retention up to 300° F.

BH Extra Flexible Fiberglas Sleeving is one of a family of electrical insulations, each designed to meet particular conditions in service. Give us a few facts about your requirements — products, temperatures, voltages — we will gladly furnish free samples for testing purposes.

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Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

BH *Fiberglas** **SLEEVINGS**

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

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REDUCED VOLTAGE STARTERS

with

air break contacts

Never before has a manually operated auto-transformer-type starter been available in such high ratings with air break contacts. Starters rated up to 75 hp, 220 volts; 150 hp, 440-550-600 volts have air break silver alloy contacts that require no cleaning, filing, or dressing. This eliminates contact maintenance . . . results in longer contact life . . . avoids dirty, messy jobs. Only the Size D starter —rated up to 125 hp, 220 volts; 250 hp, 440-550-600 volts—requires oil immersed, copper to copper contacts. Write for Bulletin 646.

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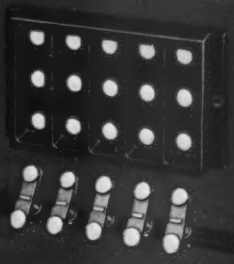
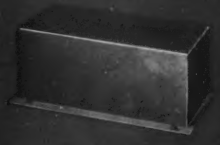
✓ *Longer Contact Life*

✓ *Less Maintenance*

✓ *Double break, silver alloy contacts*



Close-up of moving contact block and stationary contacts.



Where special conditions call for enclosures not standard, Bulletin 646 starters can be ordered with [illegible]

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QUALITY

A-B Quality

MOTOR CONTROL

BULLETIN
609

most acclaimed manual starter on the market!

Bulletin 609 hand operated starters are the recognized standard for starting and stopping small a-c motors in these maximum ratings:

Single phase—1½ hp, 110 volts; 3 hp, 220 volts.

Polyphase—5 hp, 220 volts; 7½ hp, 440-550 volts.

Ideal for industrial applications where remote push button control stations and no-voltage release are not required.

- **No Contact Maintenance**—The large double break, silver alloy contacts never need cleaning, filing, or dressing.
- **Quick Make and Break**—A simple toggle opens and closes the contacts with a snap action, preventing contact burning.
- **Push Button Operation**—Convenient "Start" and "Stop" buttons make the Bulletin 609 so easy to operate.
- **Reliable Overload Protection**—Two manually reset breakers protect the motor at all times from sustained overloads.
- **Small Size**—In spite of high current interrupting capacity, Bulletin 609 manual starters are small in size.
- **Easy to Install**—Lots of wiring room, terminals accessible from front, and knockouts on all sides of cabinet.
- **Bonderized Enclosure**—Bulletin 609 starters have pressed steel cabinets, bonderized to prevent corrosion.
- **Trouble Free Service**—Millions of these starters in operation testify to their satisfactory performance.

Allen-Bradley Co., 1316 S. Second Street, Milwaukee 4, Wis.

6-51-M

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MOTOR CONTROL

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Corporation
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Fixture Manufacturer:
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Long Island City

Glass:
CORNING
"Light-Weight"
Lens Panels

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Lighting should help make merchandise look its best *besides* adding decor to the surroundings. That's why CORNING "Light-Weight" Lens Panels were specified for the new Brooklyn unit of Lane Bryant Stores.

Corning's new clear crystal glass assures high lighting efficiency. It transmits the true color of the light source—especially important where fine fabrics are displayed. Back surface fluting cuts down end and side luminaire brightness. Fresnel design lenses distribute light evenly.

CORNING Lens Panels add special beauty to any installation. Single panels available for fixture openings of varying lengths eliminate unsightly joints. This feature streamlines appearance, does away with light leakage, and permits more design flexibility. And these are the lightest weight lenses on the market today—weighing only 1½ lbs. per running foot (11 inches wide). This makes possible lighter, less expensive fixtures and lower shipping costs.

In fact, CORNING Lens Panels cost less all around—less to buy, less to install . . . less to clean. Find out more about CORNING "Light-Weight" Lens Panels and what they can do for you. Write for information today.

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Please send your bulletin describing CORNING "Light-Weight" Lens Panels.

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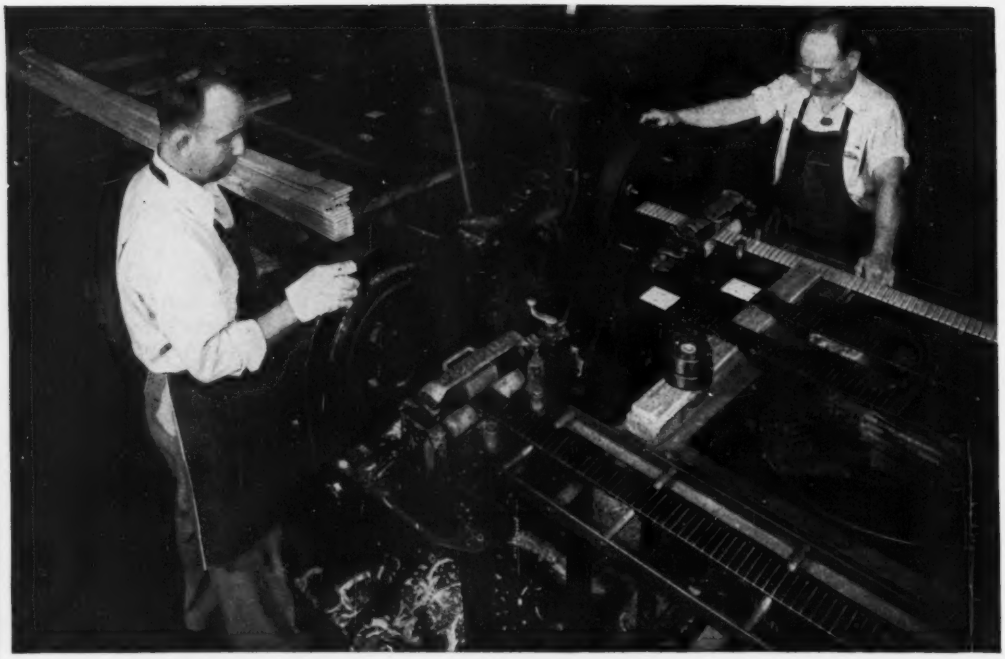
Firm_____
Address_____
City_____ Zone____ State_____



On UL labeled outdoor Bus Ducts...

Bus bars protected with plastic tape!

Ventilated "LO-X" of BullDog Electric Products Company won the first UL label for outdoor use of Bus Duct. Bus bars are wrapped with "SCOTCH" Electrical Tape No. 22.*

Bus bars of Weatherproof "LO-X" Duct are wrapped in "SCOTCH" Electrical Tape No. 22. Previous insulating material was difficult to handle and apply. New tape is mechanically wrapped on straight lengths up to 10 feet — gives excellent appearance and performance.

When *you* need insulation that resists moisture, alkalies, acids and oils try this tough new plastic-backed tape. Dielectric strength is over 10,000 volts, yet this sleek, super-thin tape is only .010 inch thick. Stretches snugly around odd shapes. Stick-at-a-touch adhesive gives moisture-tight seal —keeps weather out, prevents corrosion.

Order "SCOTCH" Electrical Tape No. 22 today from your wholesaler. Or write Minnesota Mining & Mfg. Co., Dept. EW-1051, St. Paul 6, Minn., for booklet giving you all the facts.

*Refers specifically to Underwriters' Laboratories listed busway of BullDog Electric Products Co. having bus bars wrapped with a tape insulation that is highly resistant to dampness and moisture.

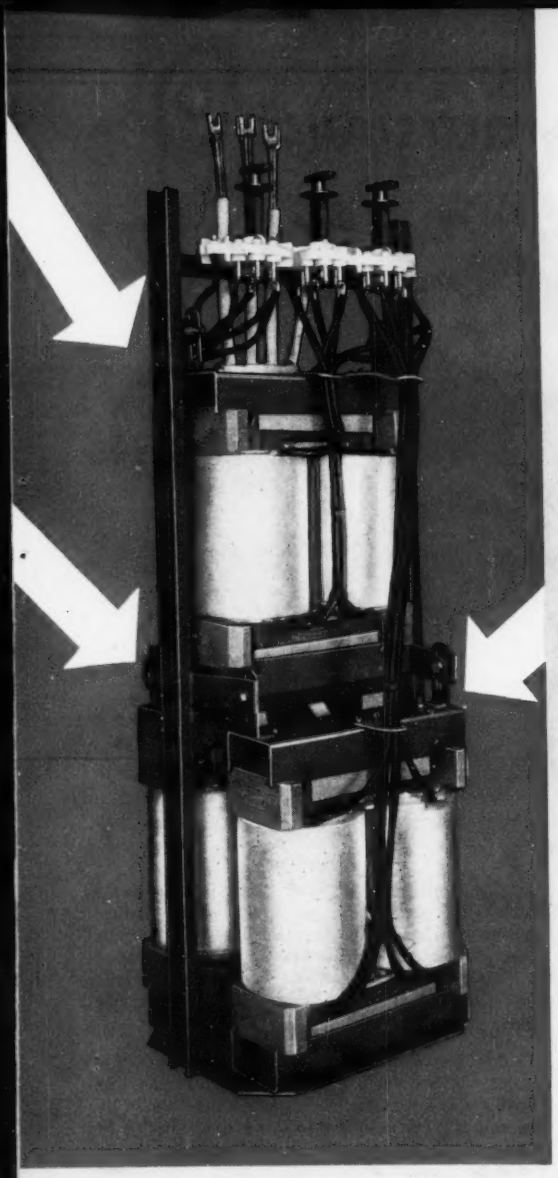
ANGULAR PIECES of bus bars are hand-wrapped with "SCOTCH" Electrical Tape No. 22. Half lap gives positive protection. Available in 36-yard rolls and in the standard widths of ½, ¾, 1 and 2 inches. Wider tape supplied to order.

Quick Facts about "SCOTCH" Electrical Tape No. 22

- **TOUGH**— plastic backing is abrasion-resistant, unaffected by water, oil, acids, alkalies, sunlight.
- **STRETCHY**— conforms to any surface.
- **HIGH DIELECTRIC**— over 10,000 volts.
- **DEPENDABLE**— won't dry out.

REG U.S. PAT. OFF.
SCOTCH BRAND
Electrical Tape
No. 22
UL

The term "Scotch" and the plaid design are registered trade-marks for the more than 100 pressure-sensitive adhesive tapes made in U.S.A. by **MINNESOTA MINING & MFG. CO.**, St. Paul 6, Minn.—also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: Minn. Mining & Mfg. Co., International Division, 270 Park Avenue, New York 17, N. Y. In Canada: Minnesota Mining & Mfg. of Canada, Ltd., London, Canada.



Three single-phase core-coil assemblies, one above and two below, for simplified mounting and best cooling. Rigidly held in strong channel-steel frame which fits into steel channels welded inside tank wall.

It's easy to replace any one unit in L-M 3-PHASE ROUND WOUNDS®

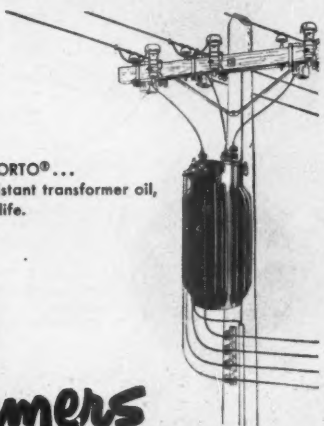
L-M Round-Wound transformers have exceedingly high impulse strength and overload capacity so that burnouts are extremely rare. But if a coil *should* burn out, you don't have to replace the whole transformer. The core-coil assembly from any one phase is simply removed from the rack and a replacement unit quickly installed.

It's as simple as that, and almost as quick . . . whether it's done in your own shops or in one of the authorized L-M Transformer Service Shops near you.

Under emergency conditions you can restore service in a hurry because with L-M construction you can connect two units in open wye or delta.

Besides the advantages of rapid core-coil replacement and fast service restoration, L-M 3-phase transformers give you all the desirable Round-Wound performance features . . . with the wound core that isn't cut or disturbed in any way after annealing . . . with the round coils wound right onto the core. An L-M "exclusive!"

Get the whole story. Ask the L-M Field Engineer or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).



Now furnished with ORTO® . . . L-M's oxidation-resistant transformer oil, inhibited for longer life.

LM®

LINE MATERIAL Transformers

Complete Coordinated Equipment for Distribution Today

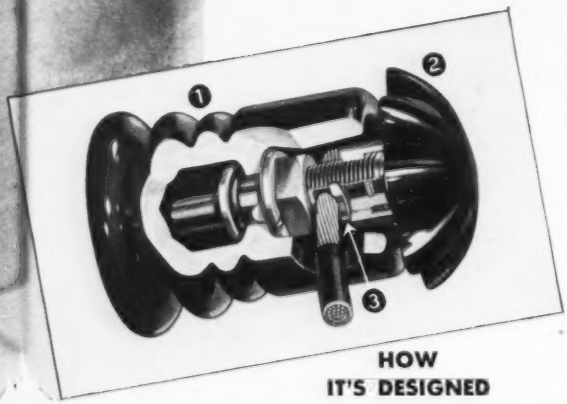
63

HERE'S L-M's OUTSTANDING

new sidewall bushing

FOR DISTRIBUTION TRANSFORMERS

← *better*
← *faster*
← *safer*



HOW IT'S DESIGNED

Heavy machined wet-process porcelain (1) with ample leakage distance. Extra strong finger-grip handle (2) will not come off accidentally, but can be removed for inspection. Heavy connector (3) machined of solid metal; conductor hole opens on one side of bushing only—conductor cannot go through to cause accidental contact; connector and hole will accommodate up to two full-size conductors. Leak-proof design inherently siphon-proof.

here's why L-M's new sidewall bushing is *better*—better for the transformer and the user because it permits lower, lighter transformers requiring less pole space . . . better because it makes a firmer, more permanent connection . . . better because of its extra strong, heavy design.

IT'S FASTER, because the lineman can make transformer connections more quickly. He inserts the bared end of the conductor into the hole in the bushing, and spins the finger-grip knob tight. That puts a permanent, firm squeeze on the conductor, assuring a good electrical connection that cannot pull out. Connector will take full range of EEI-NEMA-prescribed conductor sizes.

IT'S SAFER, because there are no exposed live parts, no sharp edges or projections to catch gloves or snag clothing. This new bushing is now standard on all L-M transformers up to 5000 volts. For complete information on L-M transformers and the new bushing, ask the L-M Field Engineer, or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

LINE MATERIAL—*Transformers*

Complete Coordinated Equipment for Distribution Today

48-8

Quiet as a kitten

ELIMINATE NOISE AND RADIO TROUBLES ON 24.9 GR.Y/14.4 KV SYSTEMS WITH THIS L-M ROUND-WOUND TRANSFORMER

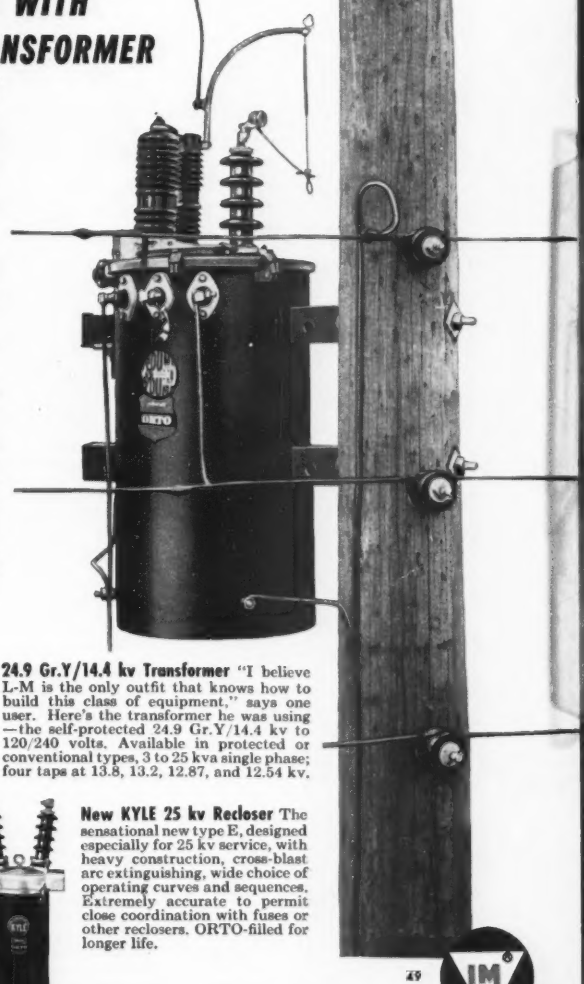
Loose cores and leaky bushings can make lots of trouble on 24.9 Gr.Y systems. Some cores get loose and hum annoyingly. The radio noise from a poorly designed bushing can drown out a distant broadcasting station—which doesn't make the neighbors happy.

L-M has built a Round-Wound® transformer especially for this service—with a core that's quiet as a whisper—it is wound from continuous strip steel, and not cut; it stays quiet!

Oil-filled bushings are specially designed and processed—they give NO radio interference.

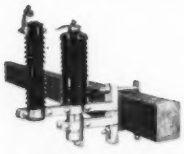
Like all Round-Wound transformers, this one has a high impulse level and high overload capacity.

The transformer and coordinated equipment have all been thoroughly tested in actual use in a number of locations throughout the country; they offer long life and dependable, economical service. Ask the L-M Field Engineer who calls on you for all the details; or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).



24.9 Gr.Y/14.4 kv Transformer "I believe L-M is the only outfit that knows how to build this class of equipment," says one user. Here's the transformer he was using—the self-protected 24.9 Gr.Y/14.4 kv to 120/240 volts. Available in protected or conventional types, 3 to 25 kva single phase; four taps at 13.8, 13.2, 12.87, and 12.54 kv.

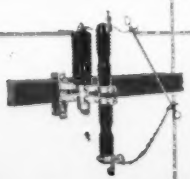
COMPLETE COORDINATED EQUIPMENT
FOR 24.9 GR.Y/14.4 KV SYSTEMS



Heavy Duty Expulsion Arrester Type PF-3, 18 kv with 65,000 amp surge capacity, gives dependable protection to transformer and system.

New 24.9 Gr.Y/14.4 kv Cutout Swivel type hanger; double entrance contacts permit fusing from either side. Silver-plated solid phosnic bronze spring and contact assembly—no steel core to nick and rust!

New KYLE 25 kv Recloser The sensational new type E, designed especially for 25 kv service, with heavy construction, cross-blast arc extinguishing, wide choice of operating curves and sequences. Extremely accurate to permit close coordination with fuses or other reclosers. ORTO-filled for longer life.



Combination Arrester and Cutout Choice of swivel hanger for crossarm mounting, shown here; or for transformer mounting (shown on transformer above), top can be rotated to assure vertical fuse mounting on any size or make transformer regardless of tank diameter.

49

LINE MATERIAL
—Transformers

Complete Coordinated Equipment for Distribution Today

Another Example of L-M Leadership

L-M's ORTO

(*oxidation-resistant transformer oil*)

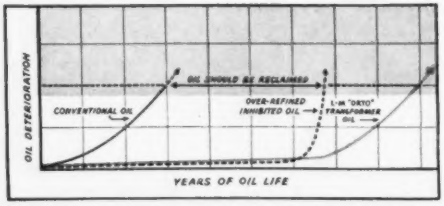
gives you all these advantages:

- longer life for the transformer, with the same overload capacity, or . . .
- higher overload capacity with the same transformer life
- reduced oil acidity and sludging
- maintained high impulse strength

and

- ORTO mixes with any other oil, conventional or inhibited
- ORTO will not react with other inhibitors
- ORTO is available as a *concentrate* for adding to your present oil stocks, for adding to power transformer oils, and for prolonging the life of reclaimed oil

Since its announcement, which led the industry, ORTO® has been a phenomenal success. Naturally L-M and L-M research engineers are gratified by ORTO's acceptance and this acceptance was deserved, by the long, rigorous careful checking into oils and inhibitors. New accelerated test methods were developed, to make sure that ORTO was as good as expected. ORTO was thoroughly tested and proved by extensive investigation and accelerated life tests representing many years of service.



Comparative curves show the deterioration of transformer oil in service. A high-grade conventional oil deteriorates at a gradually accelerating rate. Over-refined oils may have a better response to the inhibitor; but once the inhibitor has been used up, the oil has little resistance to oxidation, and deteriorates rapidly. ORTO brand oil is a high-grade conventional oil with an inhibitor which greatly extends the beginning of the deterioration, which, when it finally starts, assumes the same gradual curve as with any high-grade conventional oil.

Ask the L-M Field Engineer for information on ORTO; or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

LINE MATERIAL . . . Transformers

Complete Coordinated Equipment for Distribution Today

L-M's new EEI-NEMA...standard subway transformer gives you ROUND-WOUND construction *Plus*...

- reduced tank cross-section for smaller manholes
- cover-mounted high voltage wiping sleeves
- sidewall-mounted low voltage bushings with spade-type terminals
- sealed construction with welded cover
- gasketed handhole
- unexcelled performance—low losses; high short-time overload capacity
- ORTO®—Oxidation-Resistant Transformer Oil—inhibited for longer life

L-M's Round-Wound® Subway transformers fully meet the new EEI-NEMA standards. They are now available. In addition to having the well-known advantages of L-M Round-Wound design, they take less vault space, have better sealing, offer greater ease in making connections, and have the advantage of being filled with L-M's ORTO.

Get the whole story! Ask the L-M Field Engineer for details; or write Line Material Co., Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).

51

LINE MATERIAL...Transformers

LM

Complete Coordinated Equipment for Distribution Today

Now in Production

. . . up to the largest

A new wave of enlightened interest in Reheat is sweeping the country as the role of the high pressure, high steam cycle promises to play an increasingly important part in power-generating facilities everywhere. Today, design developments in both boilers and turbines frequently dictate the use of the Reheat Cycle. But the spiralling cost of fuels is as much a factor as any in endearing this tool—so promising from its very beginning—to the hearts of steam-electric station operators.

Radiant superheaters and radiant reheaters were engineered and fabricated by Foster Wheeler as early as 1924 for one midwest station—considered one of the country's most efficient power plants.

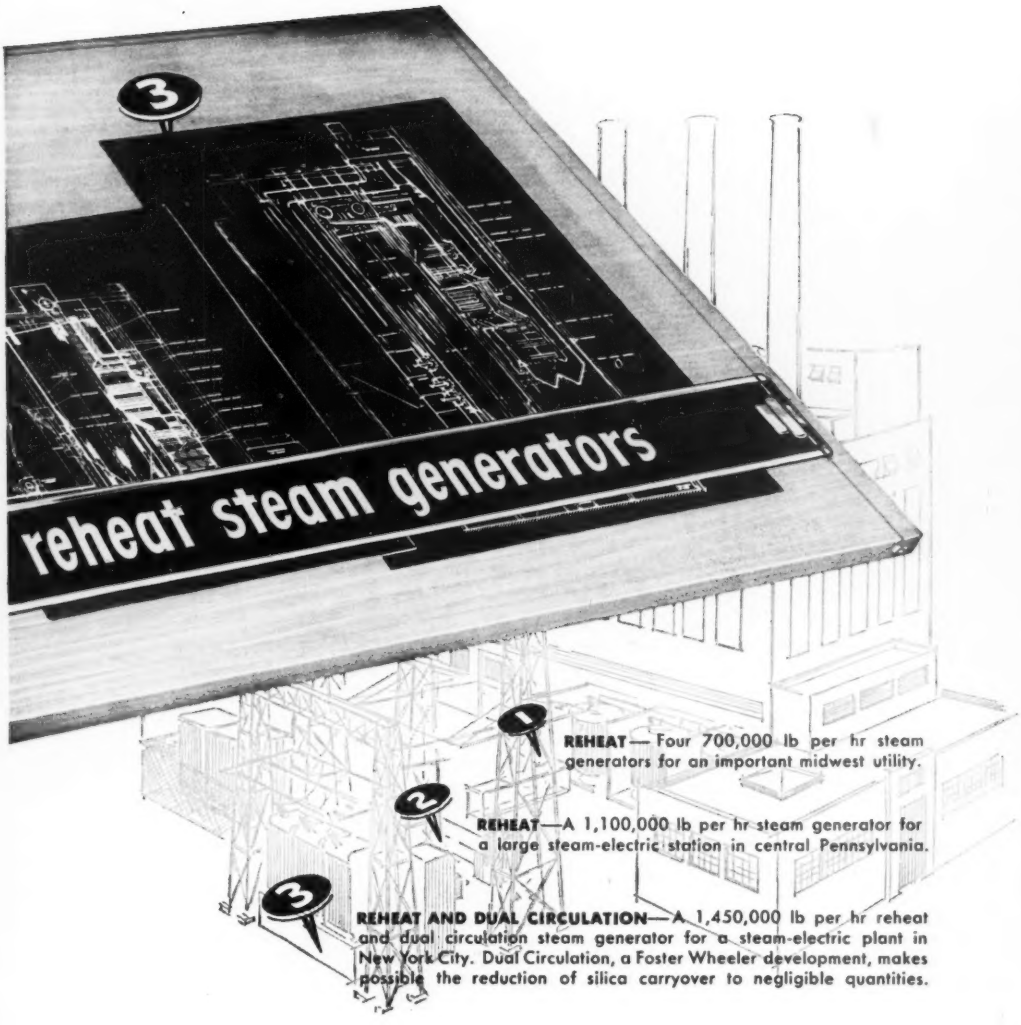
The Foster Wheeler designs shown here have the following common features:

(a) Combination radiant and convection superheaters have a natural characteristic maintaining a constant final steam temperature over a wide load range with a minimum amount of control equipment.

(b) Since superheating is done partly in the radiant superheater a two-fold purpose is served. Gas temperature leaving the furnace can be reduced and danger of slagging is thus obviated.

(c) Steam generator characteristics are integrated with those of the turbine.

For further information, write to: **FOSTER WHEELER**



REHEAT— Four 700,000 lb per hr steam generators for an important midwest utility.

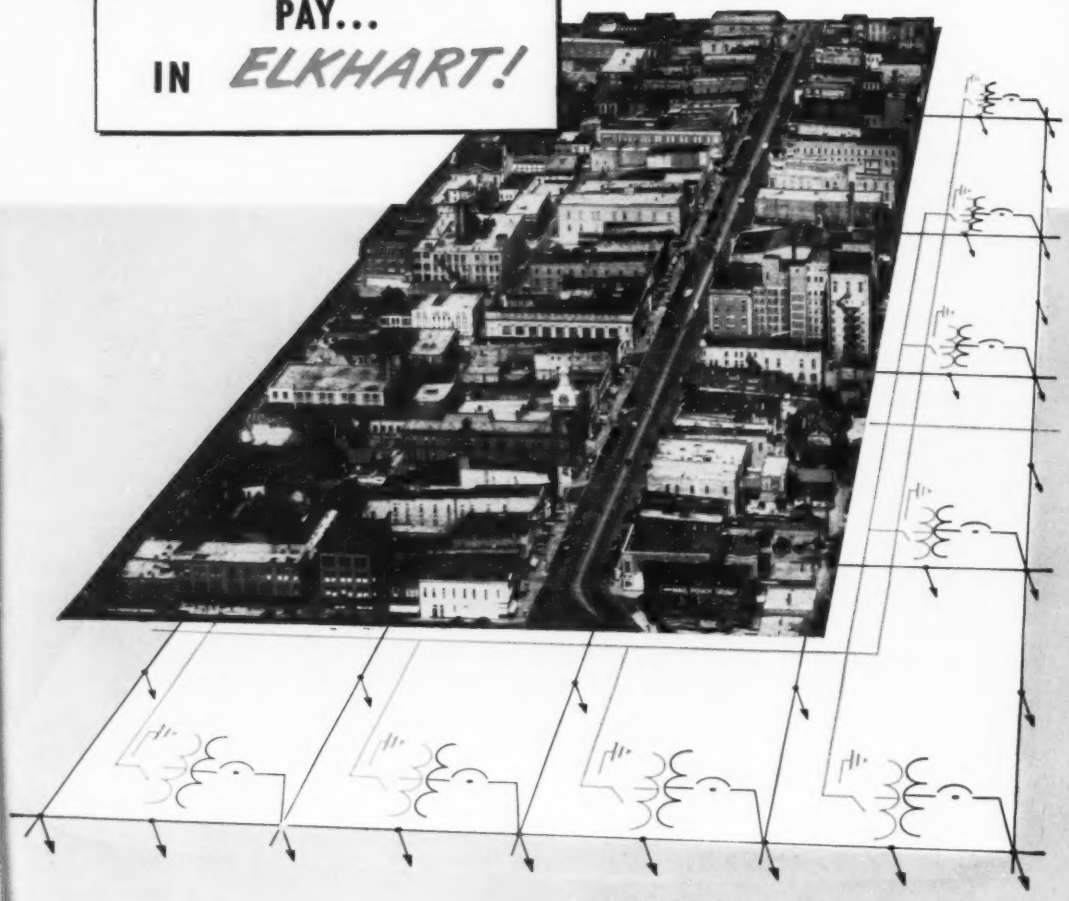
REHEAT—A 1,100,000 lb per hr steam generator for a large steam-electric station in central Pennsylvania.

REHEAT AND DUAL CIRCULATION—A 1,450,000 lb per hr reheat and dual circulation steam generator for a steam-electric plant in New York City. Dual Circulation, a Foster Wheeler development, makes possible the reduction of silica carryover to negligible quantities.

CORPORATION • 165 BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER

NETWORK SYSTEMS PAY... IN *ELKHART!*

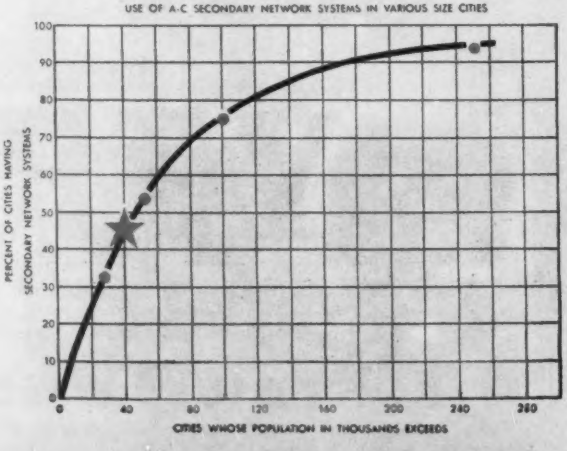


FACTS ABOUT ELKHART'S A-C SECONDARY NETWORK SYSTEM.

The secondary network system is supplied from 13 vaults having a total capacity of 3,900 kva. The area covered by Elkhart's network is almost 20 square blocks, containing 3.61 miles of conduit, 5.47 miles of primaries and 2.27 miles of secondary feeders.

•

One third of all cities in the United States with a population of 25,000 or more have network systems, while one half of all cities with a population of 50,000 or more have network systems.



17 years' uninterrupted service... no voltage-regulation problems

There's no power service problem in the business district of this bustling Indiana town of 40,000 . . . they took care of that 17 years ago. Then, Elkhart was struggling with an overloaded radial system, consisting of 3-phase primaries and both 3-phase and single-phase secondaries . . . tranformers were mounted on practically every pole. The Fire Department and fire underwriters were concerned . . . the utility was plagued with voltage-regulation problems.

OVER AND UNDER . . . In 1934 the Indiana and Michigan Electric Company met the problems of Elkhart's business district by installing an *A-C Secondary Network System*. Transformers and primaries were placed underground . . . the secondaries and services overhead. This overhead and underground combination, particularly applicable to smaller cities and towns, made possible great economy in the original installation cost.

IMPROVED SERVICE . . . The A-C Secondary Network System has resulted in a high standard of continuity of service and uniformly good voltage-regulation, not attainable through radial distribution systems. Underground placement of the primaries and transformers has greatly reduced congestion and improved appearance.

ABOUT MAINTENANCE . . . Maintenance story here is typical of all users of secondary networks . . . it's low, almost negligible. The utility reports that in 17 years of operation, there has never been a complete interruption of the system. Underground crews like the convenience of maintaining the system. They know . . . they work with the equipment.

CUSTOMERS AND UTILITIES BENEFIT . . . Utility customers appreciate the high-quality service and uniformly good voltage-regulation afforded by network service. The utility benefits from reduced operating and maintenance expense and improved customer good will. Large or small, your town can have high-quality network service . . . at a cost commensurate with the benefits this service affords. Westinghouse makes this equipment and can help in your planning. Call or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-97155

YOU CAN BE SURE.. IF IT'S
Westinghouse
NETWORK EQUIPMENT

Cables run COOLER...
in TRANSITE DUCTS

. . . reducing copper losses
. . . increasing current capacity
. . . prolonging insulation life

YOU REDUCE copper losses . . . increase current carrying capacity . . . and prolong insulation life, when you run your cables in Transite* Ducts.

Current carrying capacities can be increased in a typical duct bank as much as 5%, or I^2R losses can be reduced 11%, for cables located in Transite as compared with other ducts used for power circuits.

And, Transite Ducts assure permanent duct banks because Transite is incombustible; is immune to rust and rot; is unaffected by electrolysis; will not slag under action of an arc, and will retain its high original strength.

An unusually smooth bore assures no injury to cable sheath, either in natural movement under load, or when pulling-in cables. Long, lightweight lengths can be quickly and economically installed. In addition, a full line of fittings simplifies even the most complicated of installations.

For full information on Transite Ducts, write for Data Book DS-410. Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.

How Transite Ducts increase current carrying capacities

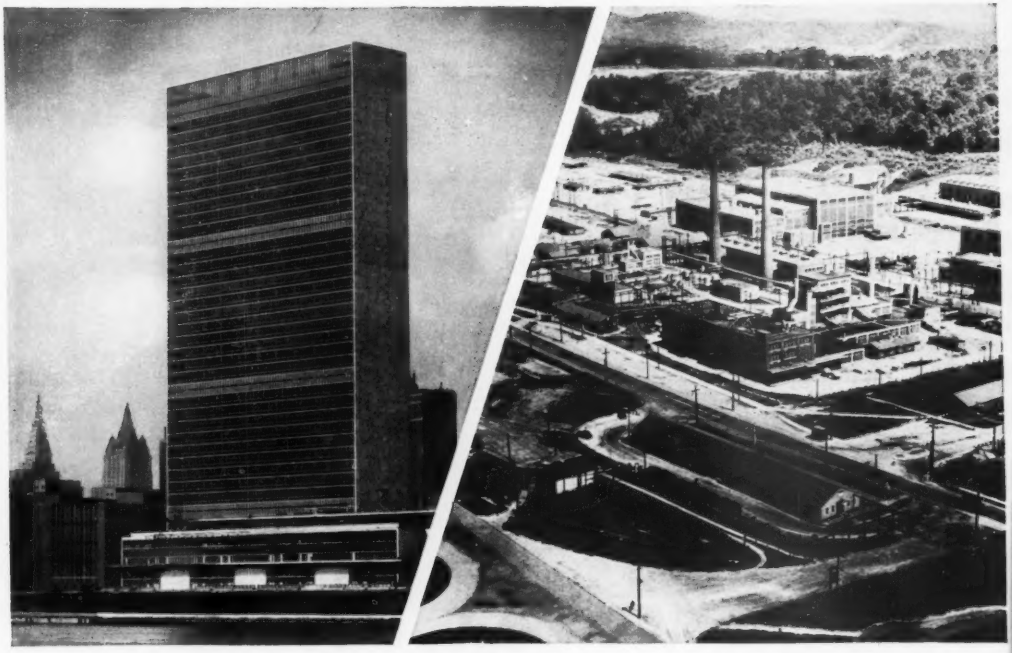
Type cable 3 cdr. 500 MCM Compack Sector, 15 KV
(6th Edition AEIC Spec.)
No. of cables—3 (all loaded in one bank)
Daily Load Factor—75%
Earth Temp. ambient—20 C

	Transite	Other
Total Therm. Res. to Dielectric Loss (C watts/ft.)	5.66	6.17
Total Therm. Res. to Copper Loss (C watts/ft.)	4.44	4.95
Temp. Rise from Dielectric loss (C)	1.9	2.1
Allowable Rise for Copper loss (C)	59.1	58.9
Allowable Watts per ft. cable	4.44	3.96
Allowable Current—(Amps. per cdr.)	386.	365.
Allowable Current—(Relative %)	105.6	1.00.

Johns-Manville *Transite Ducts*

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement



Where History is Made..

THEY USE TRUMBULL PRODUCTS TO DISTRIBUTE AND CONTROL ELECTRIC POWER

Speed of installation . . .

Dependability of performance.

These are the reasons why the builders of Oak Ridge . . . like the builders of The United Nations' new headquarters . . . so often used Trumbull products for distributing and controlling electric power.

In the apartment houses and schools, for example, they used Trumbull load centers equipped with automatic circuit breakers. And in the Atomic Energy Commission plants, they used Trumbull switchboards and motor control centers.

MORE NEWS FROM TRUMBULL

Since the building of Oak Ridge, Trumbull has developed many new products of the same types.

Trumbull's new load center—called Trumbullite—is the first to have plug-in circuit breakers with quick-make, quick-break operation.

And Trumbull's motor control centers are now in the form of CENTR-A-POWER, in which standardized starter-and-disconnect units are grouped in prefabricated, rigid steel troughs, in any arrangement.

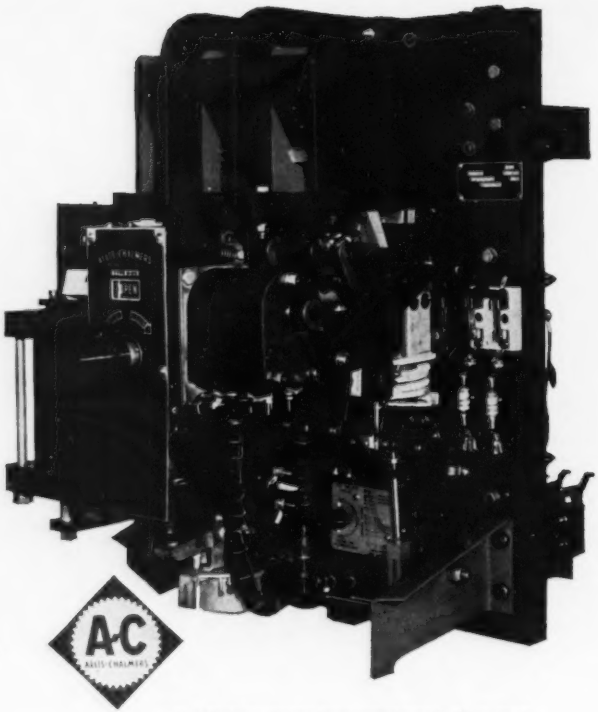
What better testimony to product acceptance . . . than to have it adopted where, for peace or war, the atomic energy plant was built . . . and where, for peace, The United Nations is erecting its permanent headquarters?

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC
PLAINVILLE, CONNECTICUT

TOUGH DUTY FOR A MOUNTING PANEL

...why Allis-Chalmers mounts this G-25 Breaker on K&M EBONIZED ASBESTOS



Allis-Chalmers electrically operated type G-25 air circuit breaker; 600 V., 600 A., 25,000 A-I-C. Breaker components mounted on panel of K&M Ebonized Asbestos.

A 600 Amp. circuit breaker is heavy machinery—it has to be for dependable operation. To mount their popular G-25 Breaker, Allis-Chalmers uses K&M Ebonized Asbestos. Here are the reasons:

THE HIGH MECHANICAL STRENGTH of K&M Ebonized Asbestos withstands the structural forces of heavy breaker operations—helps assure that components will *stay put* through the busiest duty cycles.

EXCEPTIONAL DIELECTRIC STRENGTH effectively insulates operating components. And K&M Ebonized is completely non-magnetic—is not affected by electrical stresses.

RELATIVELY LIGHT IN WEIGHT, K&M Ebonized Asbestos can be handled easily; makes a mounting panel that is extremely strong without being unnecessarily heavy or bulky.

EASY TO CUT AND TO DRILL, Ebonized Asbestos saves fabrication time and costs; will not chip or fracture while being cut or drilled.

APPEARANCE THAT HELPS SELL! K&M Ebonized Asbestos is furnished with a smooth-sanded finish, lacquered with deep-black switchboard lacquer. This attractive, durable surface adds a sales "plus" to any unit!

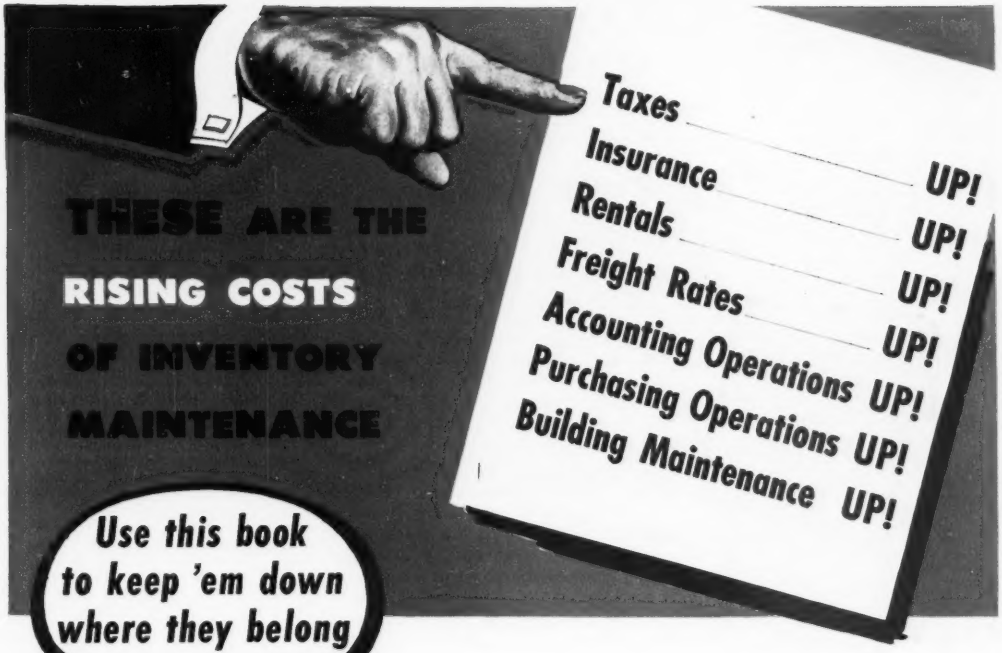
Allis-Chalmers is typical of the many progressive electrical equipment manufacturers who have found K&M Ebonized Asbestos the answer to their needs for panel mountings, test tables, bus bar supports, switchgear compartment linings, and many other applications. To find out how it can fill your needs, write us—without obligation, of course.

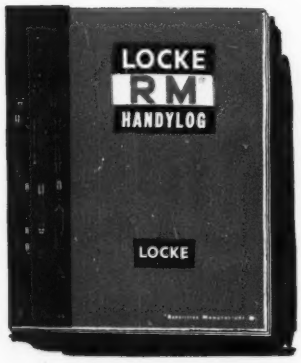
K&M best in asbestos ®

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

In Canada: ATLAS ASBESTOS CO., LTD., MONTREAL, TORONTO, WINNIPEG, VANCOUVER

Nature made Asbestos...
Keasbey & Mattison has made it serve mankind since 1873





The industry's ONLY guide to reduced inventory maintenance costs through simplification of Pole Line Hardware stocks.

To help offset the effect of rapidly mounting operating costs, many utilities are today concentrating on reducing their costs of inventory maintenance. In many cases, they are able to achieve a substantial cost reduction by further simplification of stocks.

If you're one of these, then Locke can help you.

Simplification Made Easy with Locke's RM* Handylog

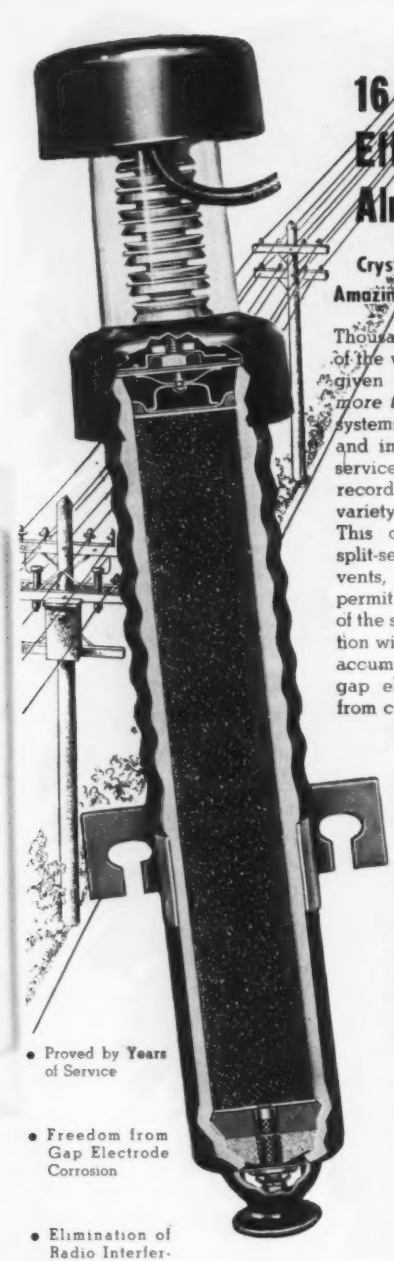
It's the perfect working partner for men wanting to further standardize and simplify their stocks of Pole Line Hardware. It lists ONLY the standard items you need. By using it, you stock fewer items, all fast movers. Each is regularly in production, and carried in stock by your Locke Regional and Distributors' Warehouse. If you haven't got a copy, write for Locke's RM Handylog today. Place the items in it on your standards list. Do this and you'll be taking the industry's only practical short-cut toward further simplification of hardware stocks. Locke Department, General Electric Company, Baltimore, Md.

*RM (Repetitive Manufacture) *A program designed to help reduce the installed cost per kilowatt on line and station equipment.*

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

Before you buy stop! **See what Locke's Got!**



16 Years' Operating Efficiency... Almost 100%!

Crystal Valve Arresters Establish Amazing Record of Efficient Protection

Thousands of Crystal Valve Arresters of the ventilated spark gap type have given unsurpassed performance *for more than 16 years* on distribution systems both here in the United States, and in foreign installations. Careful service checks indicate a performance record of almost 100% under a wide variety of service conditions.

This outstanding arrester provides split-second protection. The spark gap vents, an important design feature, permit movement of the air in and out of the spark gap housing, and circulation within the housing. This prevents accumulation of moisture, protects gap elements and housing interior from corrosion.

Other features include: glass housing for the gap structure on arresters that operate at the higher voltage ratings—inspection made easy, multiple arcing unit with smooth discharge surfaces; high speed operation. Oxidized silicon carbide valve element assures low IR voltage drop, high surge discharge capacity. Available in five voltage ratings.

Crystal Valve Lightning Arresters offer complete protection and service that lasts.

- Proved by **Years** of Service
- Freedom from Gap Electrode Corrosion
- Elimination of Radio Interference

***Write Dept. 1709** today for new folder describing in detail Crystal Valve Ventilated Spark Gap Arresters. Ask for No. 433*

ELECTRIC SERVICE MANUFACTURING CO., PHILA. 32, PA.

CRYSTAL VALVE

LIGHTNING ARRESTERS

What Makes A Good Spark Gap Assembly?

by

J. R. McFarlin, Vice President
ELECTRIC SERVICE MANUFACTURING CO.

Spark gap assemblies of valve type lightning arresters are vitally important elements of the arrester; they ordinarily consist of a series of individual gaps formed from electrodes separated by insulating spacers, and properly assembled on an insulated support; the number of individual gaps and their sparkover value is dependent on the voltage rating of the arrester; such assemblies may appear to one to be simple and ordinary structures but have you ever given thought to some of their technical aspects?

For instance, do you know why brass is ordinarily used for spark gap electrode? The reason dates back to 1892 when Alexander Wurts published results of his classic experiments on non-arcing metals for spark gap electrodes; Wurts found that the best non-arcing properties were found to exist in the metals covered by Group 2 of Mendeleff's "Periodic Arrangement of the Elements"—beryllium, magnesium, calcium, zinc, strontium cadmium, barium, mercury, radium; obviously zinc was the most practical. Zinc itself has too low a fusing point to be satisfactory as a gap element, so it was alloyed with copper, the alloy was found to be highly satisfactory and as a result, from about 1892 to the present day, practically all valve type arresters have had spark gap electrodes made of brass.

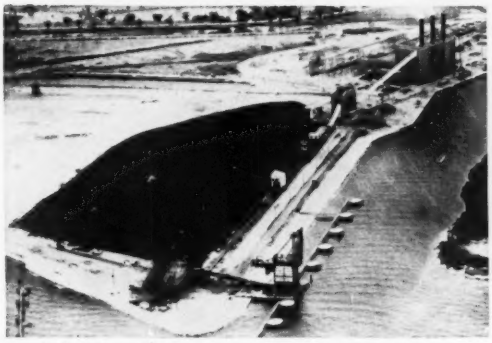
Many other factors enter into the design of efficient spark gap assemblies—zinc content of brass used, its hardness, shape of electrodes and discharge surfaces, accuracy of electrodes and spacers, inter-electrode capacitance, grading, sparkover characteristics—all of which are important in this element of the arrester.

Why do Crystal Valve lightning arresters use the particular gap assemblies they do? Back in 1916 this Company designed a spark gap unit, many millions of which have been used in various types of arresters since that time. The electrodes were circular in shape and made of brass; the arcing surfaces were somewhat flattened and smooth; they were used as single gaps and in multi-gap assemblies; in 1916 electrode spacers and supports were made of molded plastic—since 1926 they have been made of steatite; in 1916 and to date manufacturing tolerances on all parts have been held to exceptionally close limits.

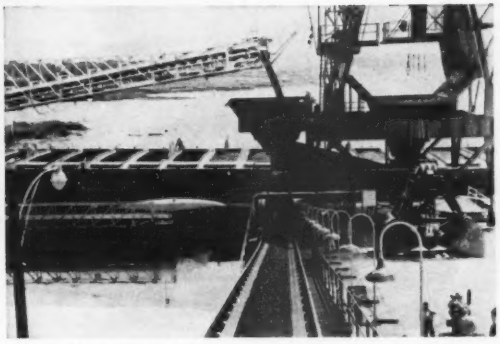
Since their development in 1916 considerable research has been done in attempts to improve the excellent characteristics of these electrodes and assemblies. Result? The spark gap structures used in Crystal Valve arresters of today are fundamentally the same as were used in arresters of our manufacture some 35 years ago and are one of the components responsible for the oustanding performance of these arresters over a period of some 26 years.

(Advertisement)

LINK-BELT engineering experience...

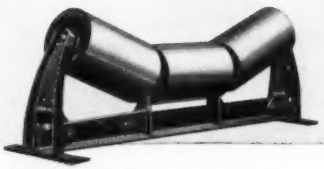


Link-Belt supplied this power plant with complete belt conveyor system for unloading, storing and reclaiming coal.



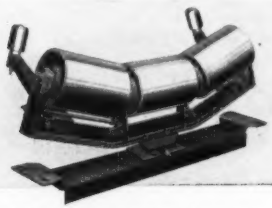
Receiving end of belt conveyor system, showing boat self-unloading coal into hopper. Another hopper and feeder handle barge coal.

Plus LINK-BELT quality components...



SERIES 100 TROUGHED BELT IDLERS. Strong, balanced integral rolls revolve on high-grade roller bearings, Grease-in, dirt-out seal, large reservoir preserve lubricant.

RUBBER-TREAD IMPACT IDLER for loading points protects the belt by absorbing the shock of heavy materials or lumps delivered from above.



BELT-TRAINING IDLER for automatic belt positioning. The actuating rolls respond to slightest contact — quickly recede and center the belt to minimize wear.

...add up to your best bet in

BELT CONVEYORS

WHAT'S your materials handling problem? Tonnage, distance or a combination of the two? Heavy or light materials? Large lumps or fines? Continuous or intermittent operation?

Whatever the conditions, you'll find the right answers at Link-Belt. For Link-Belt designs conveyor systems to meet your requirements. Backed by unmatched materials handling and power transmission experience, our conveyor specialists help you and your consultants get the right equipment in the right place.

One Source—One Responsibility

Link-Belt makes all the various elements — all types and sizes of idlers, takeups, pulleys, trippers, bearings and power transmission drives. Plus all related equipment — other types of conveyors, feeders, elevators, car dumpers and shakers.

And Link-Belt will build your supporting structures and enclosures . . . install the job completely. One source — one responsibility. Every detail receives the proper attention to assure you an efficient, trouble-free, long-life conveying system.

The next time you need belt conveyor engineering assistance, call the Link-Belt specialist in our office near you.

LINK-BELT

BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in Principal Cities. 12.380-E

Keep your Rural Line Transformers in top condition with *genuine* Wagner Parts

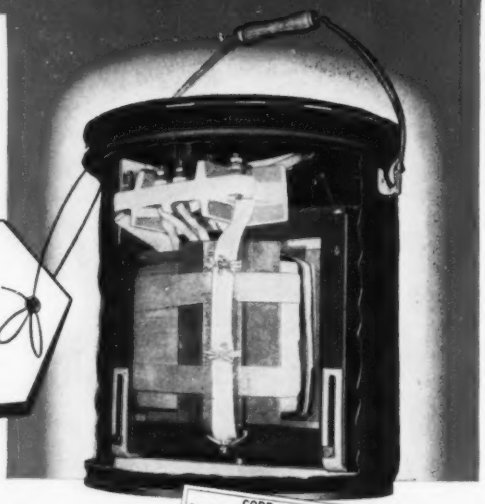
Wagner

Form W

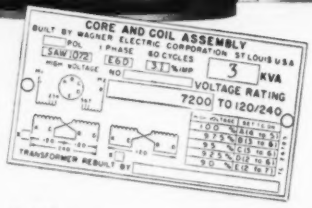
Core and Coil Assemblies

Shipped to you in sealed, transformer-oil filled containers

Ready to install without further testing or drying—



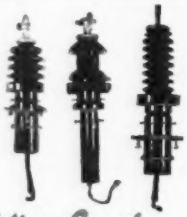
You can renew or up-rate your old or burned out transformers with factory-new Wagner Form W core and coil assemblies, exactly like those used in new Wagner Transformers. It's easy—too, Wagner assemblies come to you complete with terminal board or tap changer, with leads ready to install in your tank. Universal mounting brackets are furnished with each unit to make the installation a simple job. Wagner assemblies have passed complete factory tests—are fully dried—and are packed in Wagner 7N transformer oil, which you may also use in your tank.



New stainless steel nameplates are included with core and coil assemblies.

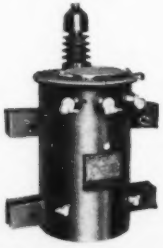
Wagner Bushing Assemblies

Low voltage bushing assembly includes porcelain bushing, solderless connector-type terminal and clamping device.



High voltage bushing assemblies in various types meet a wide range of requirements. Gasket, solderless connector-type terminal and clamping device are included—fuses can be furnished when specified.

Wagner *Complete Rebuilding Service*



Including thorough cleaning and repainting, installation of new factory wound coils and insulation, all new gaskets, and a factory inspection. All transformer rebuilding jobs are guaranteed against defective material or workmanship for one year. If complete rebuilding is not necessary, repairs will be made on a time and material basis.

Write for Transformer Repair Schedule

Wagner Electric Corporation 1891 1951

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

T551-1

Lowers Operating Costs

Steps up crew efficiency!

Powers-American bodies do their job faster, more efficiently, and at lower cost, because they're "*job-engineered.*" Each model incorporates design features *proved* by utilities over many years of operation, and is field-tested under actual working conditions by utility engineers *before* production! "*Job Engineered*" means long life and trouble-free service for you, whatever your utility body needs may be. Look to *Powers-American* as *your 1* source for *all* types of utility bodies and equipment.

HYDRAULIC TOWER

Available in models having ground-to-platform heights of 21', 25', and 30', for installation on chassis having 1½ ton capacity or more.

GENERAL SERVICE BODY

½, ¾, 1, and 1½ ton models. Can be equipped to meet any operating requirement.

FORESTRY BODY

For tree trimming and clearing. Also available with winch and derrick for construction work.

REVOLVING AERIAL LADDER

Can be extended to any length, spotted in forty positions throughout a full 360° revolution, and inclined at any angle from 30° to 75°. Easily operated by one man. Safe enough to support 4 times normal working load. Available in sizes having ground-to-platform heights from 23' 6" to 32' 3".

LIGHT CONSTRUCTION BODY (350)

Fold-over derrick can handle poles up to 40' in length. Underfloor winch leaves loading area clear.

"The Accepted Standard with Utilities Everywhere"

POWERS *American* DIVISION

AGB

PUBLIC UTILITY BODIES AND EQUIPMENT

McCABE-POWERS AUTO BODY COMPANY

[redacted]

There are many styles of *Powers-American* Bodies not shown here. Write for descriptive catalog today.

Your voice

in Davy Jones' locker

To strengthen voices in the newest submarine cables between Key West and Havana amplifiers had to be built right into the cables themselves. With the cables, these amplifiers had to be laid in heaving seas; and they must work for years under the immense pressure of 5000 feet of water.

For this job, Bell Laboratories engineers developed a new kind of amplifier — cable-shaped and flexible, with a new kind of water-tight seal.

To serve far beyond reach of repair, they developed electron tubes and other parts, then assembled them in dust-free rooms.

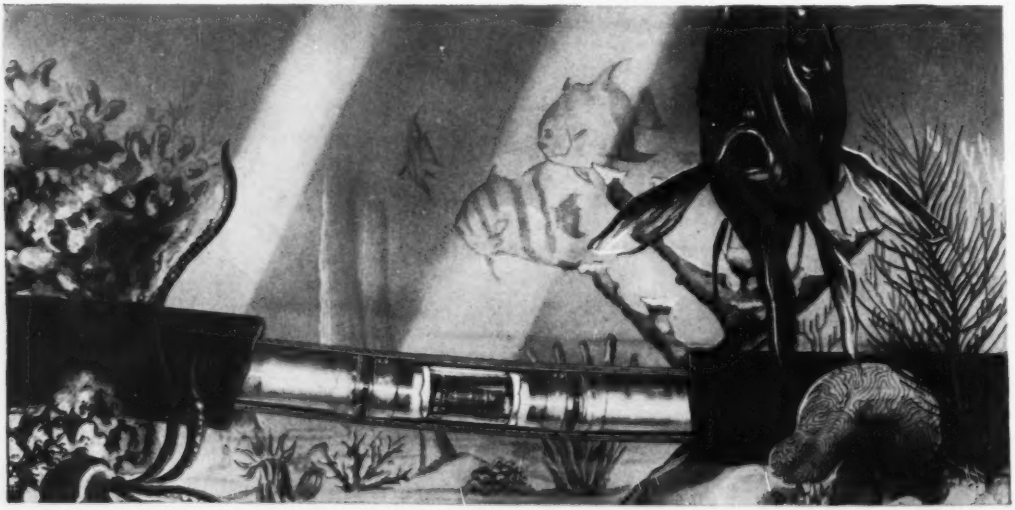
The two cables — each has but two conductors — simultaneously carry 24 conversations as well as current to run the electron tubes.

With these deep-sea amplifiers, submarine cables carry more messages . . . another example of how research in Bell Telephone Laboratories helps improve telephone service each year while costs stay low.

Cutaway view of deep-sea amplifier. Tubes and other elements are housed in plastic cases then enclosed in interleaved steel rings within a copper tube. Layers of glass tape, armor wire and impregnated fiber complete the sheath. Cable ship, shown right, payed out cable over large sheave at bow.

BELL TELEPHONE LABORATORIES

• Exploring and inventing, devising and perfecting, for continued improvements and economies in telephone service.



Everson Electric Co. counts on SILASTIC TAPE "...When insulation must stand up at 500° F"

For outstanding insulation characteristics and for lasting performance at high temperatures, the choice is Silastic* Tape at Everson Electric Company, Allentown, Pa., manufacturers of armature, field and stator coils for railway and heavy-duty industrial applications.

"The ability of Irvington's Silastic Tape to stand operating temperatures up to 500° F increases the life of our coils," says Everson, "and it saves space *too*."

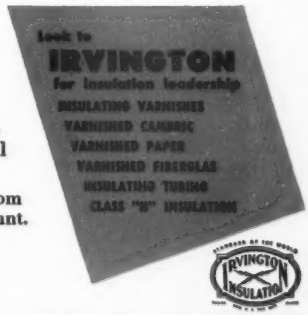
Here are some *other* reasons why so many leading manufacturers turn to Silastic Tape:

The combination of Fiberglas** cloth and Silastic rubber impregnation and coating gives high tensile strength and excellent chemical resistance, even at high temperatures.

After vulcanizing, Silastic Tape forms a solid insulation mass, free from voids or air pockets . . . moisture-proof, extremely abrasion-resistant.

Worth looking into, isn't it? Ask for the full story today!

*®Dow Corning **®Owens Corning Fiberglas Corp.



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VARNISH & INSULATOR COMPANY

Irvington 11, New Jersey

Plants: El Monte, California — Hamilton, Ontario, Canada

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Irvington Varnish & Insulator Company
6C Argyle Terrace, Irvington 11, N.J.

Gentlemen:

Please send me technical literature on Silastic Tape.

Name.....

Company.....

Street.....

City.....Zone.....State.....

High-Lights

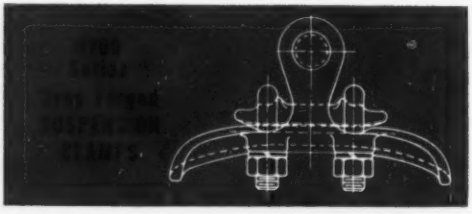
VIRGINIA ELECTRIC & POWER CO.
CONTINUING CONSTRUCTION PROGRAM

Across The James River. This 110 kv steel tower transmission line extends some 7 miles from Bremo Power Station near Bremo Bluff, Va., interconnecting with another utility to the west. Conductor is 397,500 CM ACSR. Line was placed in service August, 1950. Both this line and the line below were engineered and constructed by Stone & Webster Engineering Corp.

These lines — both of them built within the past five years — are part of Virginia Electric and Power Company's program to provide for the rapid postwar growth in electrical load. They bring to 21,000 the total line mileage operated by the 42-year old company.

Fanning out over eastern Virginia and parts of eastern North Carolina and eastern West Virginia, the company serves more than 500,00 customers. Annual production totals more than three billion kilowatthours with power supplied by eight steam-electric generating stations (total capability: more than 600,000 kw) and 16 small hydro-electric stations (total rated capacity: 45,000 kw).

From Station To Station. The 55-mile distance between Virginia Electric and Power Company's Chesterfield Power Station near Chester, Va. and its Bremo Power Station is spanned by this 110 kv wood pole H frame transmission line which was put into service in June, 1947. Conductor is 4/0 copper.



Like so many of America's major power concerns, Virginia Electric and Power Company uses BTC high transmission line hardware — shown here on both lines. Specify BTC Drop Forged Clamps and Fittings for your own transmission lines and enjoy their easier installation and efficient, trouble-free performance.

Sold Through Your Insulator Manufacturer Only

Drop Forged BTC Hi-Line Hardware

The BREWER-TITCHENER Corporation

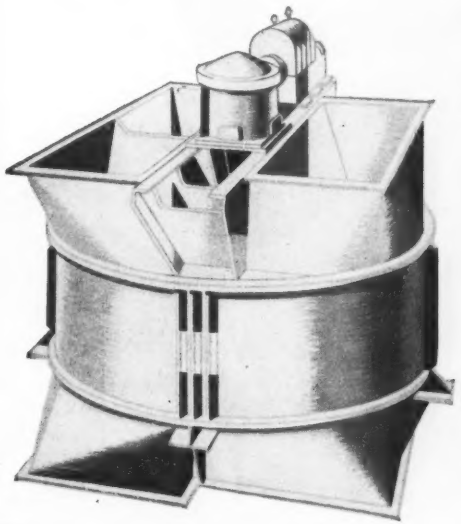
Cortland • New York

GET ALL 3 with the LJUNGSTROM AIR PREHEATER

- **Improved Combustion**
- **Better Heat Recovery**
- **Plant Material Savings**

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

If you want to improve the combustion of low-grade fuels . . . raise the level of heat recovery . . . conserve critical materials in plant design . . . you or your consultants can make profitable use of Preheater experience. Let our specialists tell you more about the Ljungstrom Air Preheater, and the outstanding job it has done for hundreds of America's leading industries and public utilities, where the need for preheated air from 300F to approximately 1200F was part of their problem. Our engineers are ready to work with you in applying the Ljungstrom to your own heat recovery problem.



THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

Facts from KANSAS

"'CSP' Transformers cut failures to zero"

"Until a few years ago, our system was equipped 100% with conventional transformers. A particularly hot rural line was giving us considerable trouble, so we decided to make a test installation of 'CSP' Transformers comprising 160 stations," says a Kansas Utility.

"Accurate records had been kept for two years prior to installation of the 'CSP' Transformers and were also kept for the two succeeding years. The records show that of the conventional transformers, 45 had been damaged by lightning, and required 491 service trips for re-fusing.

"Of the 'CSP' Transformers, not one was damaged. Only 39 instances occurred where secondary breakers opened to protect the transformers from short-circuits or overloads. This record gave us good reason to adopt the 'CSP' Transformer for all future construction and replacement."

Installation and maintenance costs for Westinghouse "CSP" (Completely Self-Protecting) Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following: J-70590

NATIONAL AVERAGES

	"CSP"	Conventional
Installation Costs	$13.87	$24.74
Burn-out Rate	0.257%	1.005%
Fuse Outages	None	5.64% @ $6.52 per outage
Load Checks	Automatic	12.8%
Breaker Reset	1.02%	None

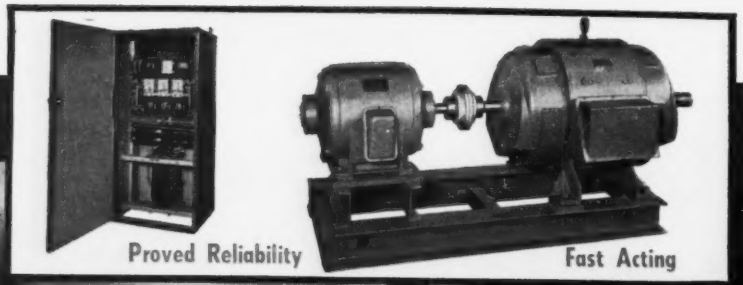
If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet 4-247-B, "Transformer Costs and Their Relation to Profits", Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

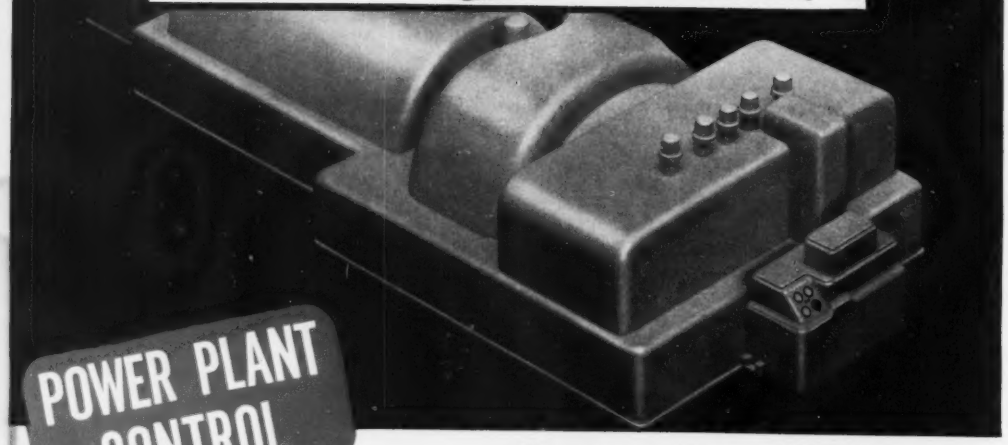
"CSP" devices . . . originated and patented by Westinghouse.

YOU CAN BE SURE... IF IT'S

Westinghouse

"CSP" DISTRIBUTION TRANSFORMERS





POWER PLANT CONTROL *Regulex* Rotating Voltage Regulators!

FOR FAST, ACCURATE, reliable control of large generators, select *Regulex* voltage regulators. The regulator's output, connected in series with the self-excited main exciter shunt field, aids or bucks excitation . . . maintains accurate line voltage.

IMPROVES SYSTEM STABILITY

You get both regulation and maximum stability from old or new generating equipment by using the *Regulex* rotating regulator. During transient loads, high amplification and fast response force the generator field current to reach the required value for stability quickly — quickly enough to keep the machine in synchronism through most faults. Its quick voltage recovery and limited overswing further aid generator stability.

AND RELIABILITY

The *Regulex* voltage regulator consists of two parts: 1) the control cubicle which contains only static devices and requires no maintenance; 2) the *Regulex* rotating amplifier which is essentially a dc generator and requires no more maintenance than a normal exciter. No special training of maintenance personnel is required.

Call your nearby A-C representative for more information, or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Regulex is an Allis-Chalmers trademark.

ALLIS-CHALMERS A-3458

Order Telegraph Systems

The Allis-Chalmers Order Telegraph System is accurate and reliable . . . can be depended upon even during station power failure because it uses the dc bus for its power source. An alarm system operates until the order is returned correctly. Five or ten inch semi-flush dials for switchboard mounting. Use it to transmit orders between switchboard and turbine room.

Automatic Speed Control for Boiler Draft Fans

Draft fans operate at exactly the required speed for perfect combustion when Allis-Chalmers Type 257 Liquid Rheostats are used with wound rotor drive motors. They are application engineered to provide straight line speed characteristics . . . automatic wide range stepless speed control. Use electric, pneumatic or hydraulic pilot devices. Ask for leaflet 14S7544.

No substitute here for EXPERIENCE

— in men and materials!

Specialized knowledge is an important part of any job. Make certain of tape quality by specifying Accurate — the tape with over 30 years experience behind its manufacture!

ACCURATE TAPES

...for every INSULATING need!

ACCURATE RUBBER TAPE

Features high elasticity, excellent cohesion, high dielectric and super aging qualities. Available in Standard and A.S.T.M.-A.A.R. grades.

ACCURATE FRICTION TAPE

High grade rubber carefully compounded with finest cotton base provides maximum mechanical protection for every wrap. Made in Standard and A.S.T.M. grades.

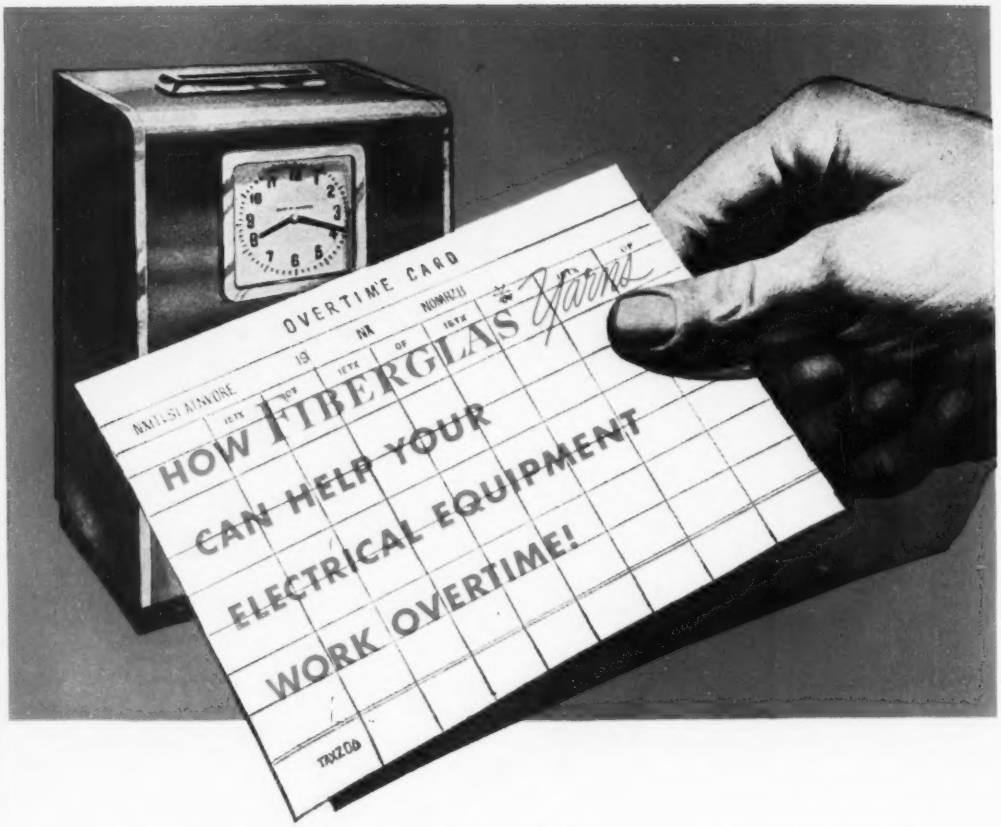
ACCURATE
Plastic Tape

Offers a bulk-reducing combination of thin caliper, good mechanical and dielectric strength. Recommended for use wherever plastic tape is practical.

...no finer tapes at any price!

For big wiring jobs or small, Accurate is the choice for positive tape protection. Both friction and rubber are strong, pliable, easy to apply. Accurate tapes make accurate wraps — pull tight and clean over irregular surfaces. When you order tape, mention Accurate by name. It's the one sure way to complete tape satisfaction. For a complete guide to tape selection and tape buying, ask for the new Accurate Data Folder. Accurate Mfg. Company, Garfield, New Jersey — address inquiries to Dept. D.

amc



In these days of serious national effort, your electrical equipment must work overtime to meet increasing civilian and military demands. Equipment will run longer, more efficiently, without breakdown if you:

- **Specify Fiberglas electrical insulations in the new equipment you buy.**
- **Specify Fiberglas insulations when you have old equipment repaired or rewound.**

Why Fiberglas? Because tough, long-lasting Fiberglas insulating materials resist heat and overloads, deliver superior service.

Space-saving characteristics of Fiberglas glass-base products also permit design of smaller, more compact, higher rated units which means conservation of other critical materials.

Because of increasing military requirements for Fiberglas Yarns, our customers are unable to get all they need. We are building new facilities to help meet these demands.

Send for your FREE copy of the booklet "Fiberglas Glass-Base Insulating Materials," Owens-Corning Fiberglas Corporation, Electrical Sales Division, Dept. 858, 16 E. 56th Street, New York 22, N. Y.

OWENS-CORNING FIBERGLAS *Yarns*

*Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with fibrous glass.

FIBERGLAS IS IN YOUR LIFE...FOR GOOD!

SYLVANIA Light Bulbs mean BRIGHTER BUSINESS because:

In response to your requests, Sylvania 4-Packs are pre-price-marked with suggested retail list prices on the cartons . . . on the sleeves . . . on the bulbs.

1. New Popular Premium Offer: All-Aluminum HANDY-TONGS

Only **25¢** with the outside of a Sylvania 4-Pack

2. National Advertising *plus* Big Weekly TV Show

Big space advertising in *Look*, *McCall's*, *Good Housekeeping*, *Better Living*, and *Everywoman's Magazine* will tell millions about the Handy-Tongs offer. This premium will also be demonstrated on the nationwide TV show "Beat the Clock."

3. FREE Bright, Appealing Store Displays

Colorful window streamers and counter cards are furnished free. Eye-catching ad mats for local newspapers are also offered free of charge. As the first step toward brighter bulb business, mail the coupon NOW!

SYLVANIA

LIGHT BULBS; FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; PHOTOLAMPS; TELEVISION SETS

Sylvania Electric Products Inc.
Dept. L-7110, 1740 Broadway
New York 19, N. Y.

Please send me full details about Sylvania's big fall light bulb promotion plan (1-543).

Name_____

Street_____

City_____ Zone____ State_____

GLARE ELIMINATED

without sacrificing efficiency

California state highway specifications called for: *"high roadway brightness, with* additional shielding *to prevent distracting glare* . . . at a no more than 2% loss in lighting efficiency."

A special shield for the Westinghouse OV-20 mercury-vapor unit minimized glare and showed these results: *less than 2%* loss in efficiency.

With thousands now installed, they have discovered that this is also one of the easiest street lighting systems to maintain. Relamping is a one-hand operation, because of the hinged construction. Routine cleaning is speedy.

What's more, this unit provides lighting distribution patterns for both wide and narrow highways.

It will pay you to investigate the Westinghouse mercury-vapor street lighting systems. Send for B-3876-A, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-04300

YOU CAN BE SURE.. IF IT'S
Westinghouse

PLANNED
LIGHTING SYSTEMS

Amcreco

CREOSOTED POLES

do 3 big jobs

1 **INCREASES LIFE EXPECTANCY OF YOUR LINES** Carefully selected, naturally strong timber is scientifically pressure treated the entire length to produce poles of highest strength and durability. Service records showing from 25 to 40 years of useful pole life prove the long life expectancy of Amcreco creosoted poles.

2 **LOWERS INITIAL COST . . . REDUCES MAINTENANCE EXPENSE** — Poles of practically constant strength promote pole line economy. Smaller sizes and longer spans are possible . . . a lower factor of safety can be allowed . . . lines stay up longer . . . fewer replacements of poles and cross arms are required.

3 **GIVES DEPENDABLE SERVICE UNDER SEVEREST CONDITIONS** — Lines constructed with Amcreco poles are planned for the future. Built for permanence and dependable service under all conditions, Amcreco creosoted poles provide greater long-term economy.

Get the whole story about long lasting, money saving Amcreco poles. Ask for detailed information on actual service records. Write today.

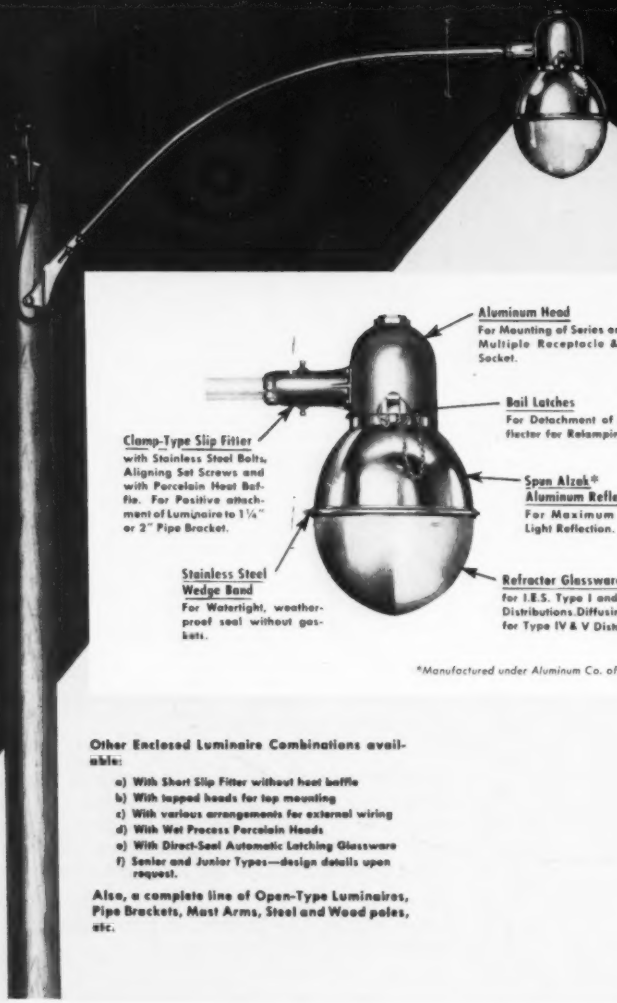
Amcreco
Lowry Process
Creosoted Products

POLES
CONDUIT
CROSS ARMS

AMERICAN CREOSOTING COMPANY
INCORPORATED
COLONIAL CREOSOTING COMPANY
AMCRECO
GEORGIA CREOSOTING COMPANY
LOUISVILLE, KENTUCKY

Pressure treated for strength that lasts

JOSLYN *ENCLOSED LUMINAIRES*



LUMINOUS EFFICIENCY

ELECTRICAL DURABILITY

PERMANENT AND RUGGED

CONVENIENCE OF OPERATION

Aluminum Hood
For Mounting of Series or Multiple Receptacle & Socket.

Bail Latches
For Detachment of Hood from Reflector for Relamping.

Clamp-Type Slip Fitter
with Stainless Steel Bolts, Aligning Set Screws and with Porcelain Heat Baffle. For Positive attachment of Luminaire to 1¼" or 2" Pipe Bracket.

Span Alzak* Aluminum Reflector
For Maximum Specular Light Reflection.

Stainless Steel Wedge Band
For Watertight, weatherproof seal without gaskets.

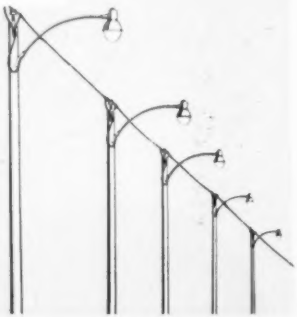
Refractor Glassware
for I.E.S. Type I and III Light Distributions. DiffusingGlobes for Type IV & V Distributions.

*Manufactured under Aluminum Co. of America Patents

Other Enclosed Luminaire Combinations available:

a) With Short Slip Fitter without heat baffle
b) With tapped heads for top mounting
c) With various arrangements for external wiring
d) With Wet Process Porcelain Heads
e) With Direct-Seal Automatic Latching Glassware
f) Senior and Junior Types—design details upon request.

Also, a complete line of Open-Type Luminaires, Pipe Brackets, Mast Arms, Steel and Wood poles, etc.



Branch offices in principal cities

•

THE JOSLYN CO.
THE SOUTH EAST-JOSLYN CO.
SOUTHERN JOSLYN CO.
JOSLYN SOUTHWEST CO.
JOSLYN-PACIFIC CO.

JOSLYN

Complete Pole Line Equipment

20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

G. AND
PPLY CO.

For MAXIMUM SERVICE CONTINUITY

Transfer Loads with G&W AUTOMATIC LOAD BREAK OIL SWITCHES

When even short interruptions of electric service can be very costly and inconvenient, an alternate power source and a means of instantaneous switching must be provided to assure service continuity.

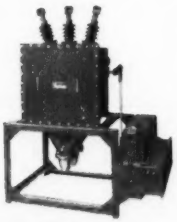
G & W automatic load break oil switches furnish relatively inexpensive insurance against interruption of service when an alternate feeder is available. They will automatically transfer load to an alternate feeder whenever the preferred feeder voltage drops to 65% of normal.

5,000, 7,500, and 15,000 volt switches are made with two types of automatic mechanisms to meet individual requirements.

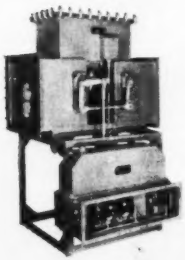
AUTOMATIC THROWOVER TO EMERGENCY FEEDER
MANUAL THROWBACK TO PREFERRED FEEDER

This double-throw switch with Model "A" automatic operating mechanism will transfer load to the emergency feeder in a fraction of a second when the preferred feeder voltage drops to 65% of normal. A detachable handle is used to return load to the preferred feeder and reset the mechanism after the preferred feeder is re-energized.

AUTOMATIC THROWOVER TO EMERGENCY FEEDER
AUTOMATIC THROWBACK TO PREFERRED FEEDER



Fully automatic operation is obtained with this double-throw switch equipped with Model "E" transfer mechanism. Restoration of preferred feeder energizes a control circuit to return load to preferred feeder 2½ minutes after it is re-energized.



Two single-throw load break oil switches with link compartment and Model "E" automatic operating mechanism assure full service continuity with no sacrifice in accessibility to feeders for repair or routine maintenance. Links permit easy isolation of either switch and connected feeder without interrupting service to the load from the other feeder.

Write for Your Copy of Bulletin DA50—Full Descriptions of Automatic Load Break Oil Switches.

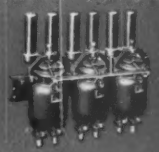
Use G & W Cable Accessories for
TERMINATING
FUSING—SWITCHING
SPLICING—CONNECTING

POTHEADS

Trouble-Free Cable Terminations
Capnut Style Disconnecting Straight Through
Write for Bulletin AB51

Type "ST-SODERTITE"—*Bulletin AA50*

OIL FUSE CUTOUTS



Single or Gang Operated Fuse-Switch Units
Write for Bulletin CA50

CABLE BOXES

Air or Oil Filled
Fuses, Links or Direct Connection

Many Sizes, Styles, Ratings

UNIT SPLICING KITS

Packaged Materials for Properly Designed Joints for all Types of Cables
Write for Bulletin J50

G&W ELECTRIC SPECIALTY COMPANY
7780 DANTE AVENUE • CHICAGO 19, ILLINOIS, U.S.A.
Representatives in principal cities. In Canada, Powerlite Devices, Ltd., Toronto

New Arrester

Westinghouse Type LX provides 20,000 amperes ...highest short circuit capacity available today!

Here's a completely new expulsion-type arrester that brings you the kind of protection you've been looking for. Note how these features contribute to more positive protection . . . longer arrester life.

Highly current limiting—a longer arc path over a spiral course limits follow current flow through the arrester to a fraction of available fault current.

High surge discharge capacity—well over NEMA requirement of 65,000 amperes.

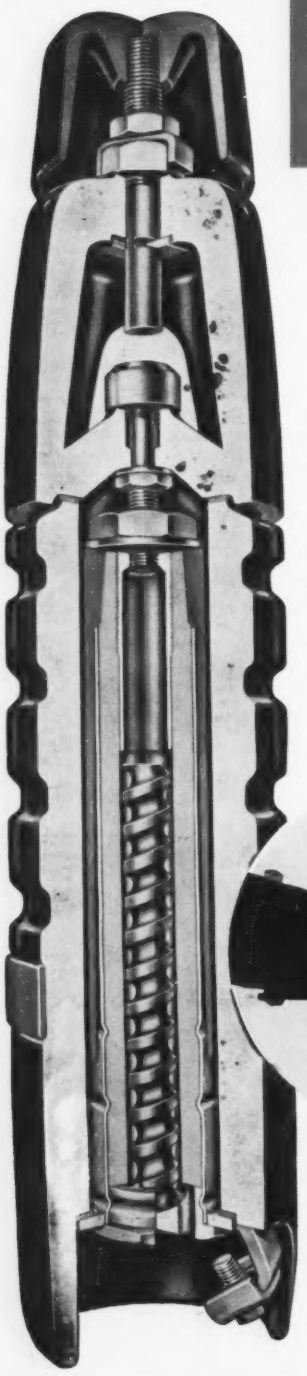
Low and consistent sparkover—skillful design has produced a gap of considerable length which sparks over at very low value.

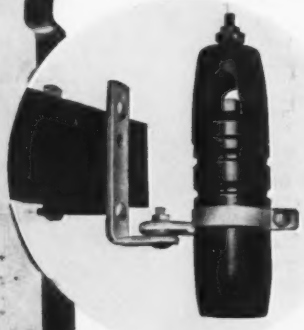
Low IR drop—since the arc drop is the only voltage that appears across the arrester during the flow of surge current, the discharge voltage is inherently low.

Operating elements totally enclosed—available with enclosed isolating gap (as shown) or with external isolating gap at bottom. With polyethylene cap (slight extra cost), fully enclosed type has no exposed metal parts at line, ground or intermediate potential. Cap pushes on; no metal springs, no turning necessary.

Easy voltage identification—each ring on main porcelain body indicates 3 kv of rating. For example, cutaway arrester pictured is 9 kv, arrester in inset is 3 kv.

Longer life—limitation of power follow current insures exceptionally long arrester life.





Descriptive Bulletin 38-150 explains how this revolutionary new LX design brings you these matchless benefits. Ask your Westinghouse representative for a copy or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-60764

3-kv, Type-LX, "De-ion®" Expulsion Lightning Arrester with crossarm mounting bracket. This arrester has a short-circuit rating of 20,000 amperes. Ratings range from 3 to 15 kv.

YOU CAN BE SURE... IF IT'S

Westinghouse

LIGHTNING ARRESTERS

V.C. CABLE

Wherever you need resistance to heat, oil and grease . . . specify Roebling Varnished Cambric

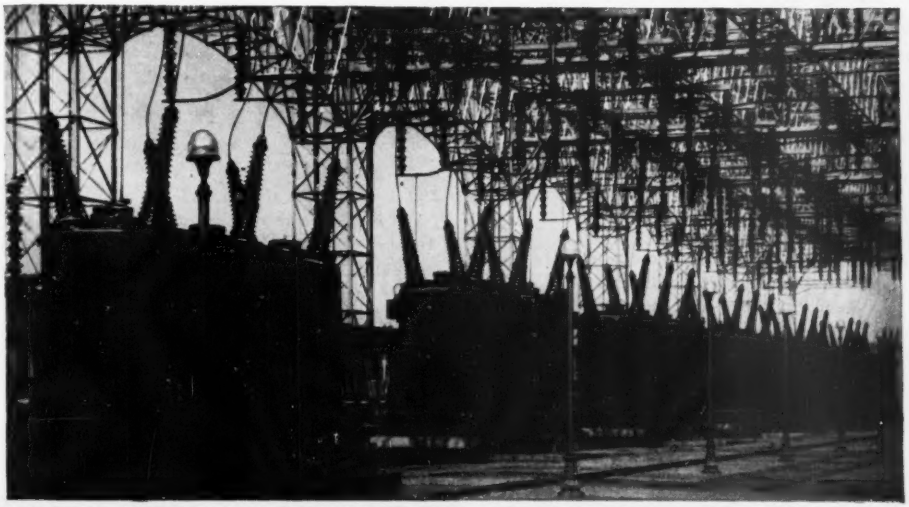
AS LEADS for generators, transformers, motor and oil switches . . . for general distribution of heavy power loads in manufacturing and industrial plants, your top specification is Roebling Varnished Cambric Cable. . . . Roebling V.C. is made in single conductor sizes from 2,000,000 C.M. to #14 A.W.G.; in multiple conductor sizes from 750,000 C.M. to #14 A.W.G. It is recommended for use up to 17,000v between phases in single or multiple conductor construction; and to 26,000v for single conductor grounded/neutral.

Large quantities of Roebling's complete wire and cable line are now required in the rearmament program. The Roebling organization and distributors will do their best, however, to meet your delivery needs. John A. Roebling's Sons Company, Trenton 2, N. J.

Manufactured with solid conductors or stranded in a variety of strandings, coated or uncoated, according to your needs. Available in single or multiple conductor.

Insulated with varnished cambric tape, in accordance with I.P.C.E.A. and Underwriters' specifications unless otherwise specified by you.

For outside covering you have a choice of braid, for service in dry locations; lead, for service in damp locations; and for aerial use or direct burial we recommend a protective armor such as steel tape or galvanized round wire armor.



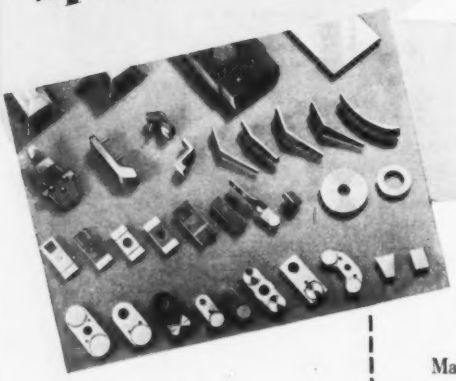
ROEBLING

Atlanta, 934 Avon Ave ★ ***Boston,*** 51 Sleeper St ★ ***Chicago,*** 5525 W. Roosevelt Rd ★ ***Cincinnati,*** 3253 Fredonia Ave ★ ***Cleveland,*** 701 St. Clair Ave, N.E. ★ ***Denver,*** 4801 Jackson St ★ ***Detroit,*** 915 Fisher Building ★ ***Houston,*** 6216 Navigation Blvd ★ ***Los Angeles,*** 216 S. Alameda St ★ ***New York,*** 19 Rector St ★ ***Odessa, Texas,*** 1920 E. 2nd St ★ ***Philadelphia,*** 230 Vine St ★ ***San Francisco,*** 1740 17th St ★ ***Seattle,*** 900 1st Ave, S. ★ ***Tulsa,*** 321 N. Cheyenne St ★ Export Sales Office, ***Trenton, N. J.***

Value Beyond Specification!

ELKONITE*

has no "equivalent"



. . . *only* Mallory Elkonite *Delivers Top Performance*

ELKONITE CONTACTS

Elkonite contacts are made by a unique and time-proved method which permits the combining of the desirable features of basic metals which cannot be alloyed. By this means, the high melting points of tungsten, molybdenum, or their carbides, can be combined with the current-carrying ability of silver and copper. Elkonite materials are best known for their hardness, resistance to mechanical wear and impact, resistance to erosion by arcing (AR factor), and resistance to sticking.

Many years of pioneering in powder metallurgy of incompatible metals enabled Mallory to originate the Elkonite group of contact materials developed specifically for circuit breakers and other heavy duty electrical equipment.

Today, Elkonite continues to stand out among all powder metallurgy contact materials...by virtue of a superiority which stems not only from the properties of the constituent metals ***but also from the technique by which they are combined.*** Mallory engineers have so developed this art that no other material can equal Elkonite in conductivity, impact strength, hardness, AR** factor, and heat resistance.

Only by specifying true Elkonite, are you assured of top performance . . . the result of precision compounding and years of experience with powder metallurgy for contact applications.

That's value beyond specification!

Mallory contact know-how is at your disposal. What Mallory has done for others can be done for you.

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

*Reg. U.S. Pat. Off.
**The ability of a contact material to withstand the erosion of an electric arc.

Electrical Contacts and Contact Assemblies

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SERVING INDUSTRY WITH

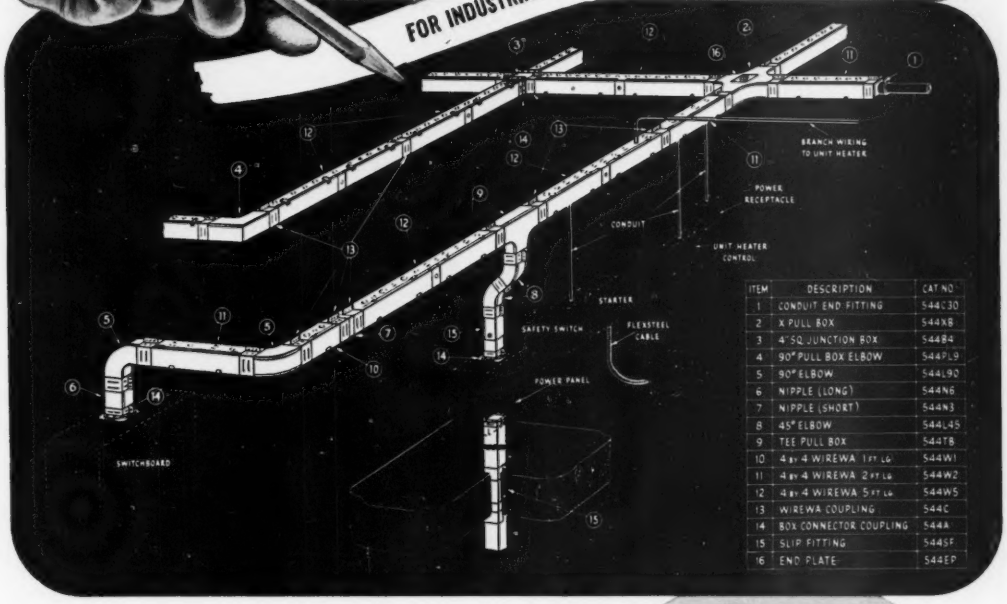
Electromechanical Products
Resistors *Switches*
TV Tuners *Vibrators*

Electrochemical Products
Capacitors *Rectifiers*
Mercury Dry Batteries

Metallurgical Products
Contacts *Special Metals*
Welding Materials

Specify National Electric 4x4 WIREWĀ

FOR INDUSTRIAL AND COMMERCIAL WIRING MODERNIZATION



ITEM	DESCRIPTION	CAT. NO.
1	CONDUIT END FITTING	544C30
2	X PULL BOX	544X8
3	4" SQ. JUNCTION BOX	544B4
4	90° PULL BOX ELBOW	544PL9
5	90° ELBOW	544L90
6	NIPPLE (LONG)	544N6
7	NIPPLE (SHORT)	544N3
8	45° ELBOW	544L45
9	TEE PULL BOX	544T8
10	4 by 4 WIREWA 1 FT. LG.	544W1
11	4 by 4 WIREWA 2 FT. LG.	544W2
12	4 by 4 WIREWA 5 FT. LG.	544W5
13	WIREWA COUPLING	544C
14	BOX CONNECTOR COUPLING	544A
15	SLIP FITTING	544SF
16	END PLATE	544EP

Sketch of a typical 4 x 4 WIREWĀ installation showing complete flexibility, simplicity and use of fittings.

Plant men like National Electric 4 x 4 WIREWĀ for protecting wiring—wiring that may be rerouted, changed, tapped, or spliced frequently. National Electric WIREWĀ provides steel protection, plus accessibility, unequalled by any other type of wiring raceway, for housing of electrical wiring systems up to 600 volts.

STEEL FOR PERMANENCE . . .
GROUNDED FOR SAFETY!

Listed by Underwriters' Laboratories, Inc.

HERE'S WHY

4x4 Wirewā will do the job.

- **It goes up fast . . . can be tapped or rerouted without disturbing existing installations.**
- **No flanges to line up and bolt when assembling sections. Wrap-around hinged couplings—only two bolts to tighten.**
- **It may be mounted direct to wall or suspended from ceiling. Couplings may also serve as hangers.**
- **Low maintenance, simple to reroute and extend —100% salvable.**

EVERYTHING IN WIRING POINTS TO

National Electric
PRODUCTS CORPORATION

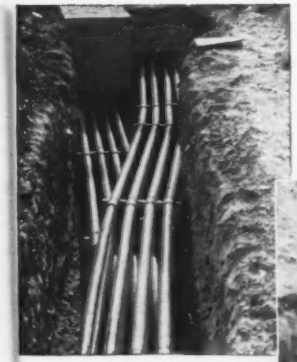
1305 CHAMBER OF COMMERCE BUILDING, PITTSBURGH 19, PA.

"Well protected cables keep power flowing

That's why I specify

ORANGEBURG"

—says the Utility Engineer

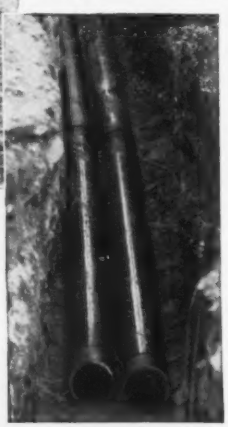


ORANGEBURG STANDARD

. . . installed with concrete encasement. The *preferred* conduit for banks of three or more ducts.

ORANGEBURG NOCRETE

. . . installed *without* concrete encasement. Its extra heavy wall makes NOCRETE practical for many single or double duct runs.



Here are some of the ways by which Orangeburg® Fibre Conduit protects cables and wins the confidence of Utility Engineers.

• Will not corrode. Lasts indefinitely. • Impermeable wall and tight joints prevent corrosive ground waters from entering. • Lays faster and at lower cost than any other type of conduit. • Low coefficient of friction keeps pulling tensions on cable to minimum. • Protects cable sheath from abrasion when pulled in—also from wear during cable movement due to alternate expansion and contraction with changing loads. • Resists acids, alkalis, grease, oil. • Light, easy to handle and tool on the job. • Tough, resilient—will not crack or break when properly handled.

Nearly 19,000,000 More Potential Users

Since 1940, the national population has shot well beyond 150,000,000. There are now nearly 19,000,000 more people than there were ten years ago calling on industry and business to produce the goods and provide the services they demand. This, of course, greatly expands the need of electrical services. Ever-increasing amounts of the *vital fluid* must be kept flowing to industry, business, all service institutions and homes.

But only fully protected cables can transmit power unfailingly. Realizing this, more and more public utilities and municipalities are turning to Orangeburg Conduit. Why? Because the Utility Engineer knows . . . as he has known for 58 years . . . that Orangeburg provides a time-defying raceway for the permanent protection of electrical services underground.

ORANGEBURG MANUFACTURING CO., INC., ORANGEBURG, N. Y.

ORANGEBURG FIBRE CONDUIT

STANDARD Installed with Concrete

NOCRETE Installed without Concrete

Graybar ELECTRIC COMPANY

DISTRIBUTORS, ORANGEBURG FIBRE CONDUIT

GENERAL ELECTRIC SUPPLY CORPORATION

Branches and Stocks in Principal Cities

public utilities

GET THE JOB DONE WITH

MALL CHAIN SAWS

Out on the "line" telephone and power maintenance men like the job Mall Chain Saws do. Hundreds of times each week, hazardous obstructions to communications are removed —fast, easily and safely.

Take the Model 1E12 shown at work as an example. Mall designed this hand chain saw for difficult cutting work. It's 11 pounds light —easy to operate from any position. Cuts limbs or trees up to 24″ in diameter. Has a rugged universal electric motor powered by the Mall 1DC Generator.

Use it for cutting propping timber, poles, cutting out tree roots and hundreds of other jobs. See your local Mall dealer for a demonstration of Mall Chain Saws. Choose from ten models.

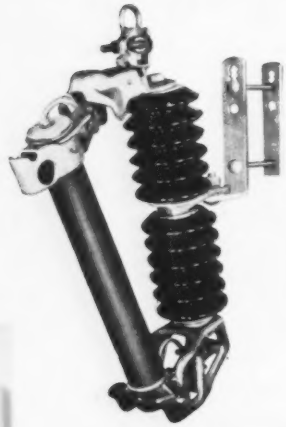
MALL TOOL COMPANY

EXECUTIVE OFFICES: 7826B S. Chicago Avenue, Chicago 19, Ill.

FACTORY SALES and SERVICE BRANCHES IN 33 PRINCIPAL CITIES

Chain Saw Movies Are Available for Special Showing to Interested Groups.

Versatility



Type HH-33-D

SOUTHERN STATES CUTOUTS KEEP PACE WITH GROWING SYSTEMS

Industrial growth, stimulated by stepped-up defense efforts, results in higher concentration of population. As burdens increase on distribution systems, changes to increase capacity are necessary. Greater loads requiring heavier conductors and equipment mean higher fault currents.

Interchangeability of fuse holders in each voltage rating of Southern States' open type dropout cutouts answers the need for simple, easy convertibility to meet changing system requirements. By installing versatile Southern States' cutouts, you can meet excessive loads and increased fault currents . . . ECONOMICALLY.

Consider the case where loads outgrow the continuous current ratings, and increased system capacity exceeds interrupting ratings of installed Southern States' cutouts. Linemen can easily, quickly and safely replace overloaded fuse holder with one of higher capacity. Labor expense of the line crew required on complete fuse installation is avoided. The fuse mountings stay in service and losses due to handling removed cutouts are eliminated.

The fuse protection capacity of your system can be increased at moderate cost with no loss of customer service time.

The accompanying tables show the continuous current and interrupting capacity available.

Type H-33-D

Type 33-D

FOR COMPLETE INFORMATION WRITE FOR BULLETIN No. 178-D

Plus Proven Performance

THE KEY TO FUSING ECONOMY

HERE'S PERFORMANCE *You Can See . . .*

Here is a Southern States Type H-33-D undergoing a recent field test. . . stopped by camera and oscillograph. Graphically illustrated in this unretouched photograph is the DOUBLE-VENTING expulsive action featured in all open type Southern States' cutouts and power fuses.

Employing DOUBLE-VENTED fuse holders, Southern States' cutouts are available in interrupting capacities of more than 450,000 KVA. Gas pressure is relieved faster by double-venting, permitting greater currents to be interrupted without danger of rupturing the tube.

There is no mechanical reaction to deliver damaging shock forces to the fuse. Recoil from the high velocity of expelled gases is eliminated since the two escaping gas columns oppose and balance each other.

Gases escaping at both ends of the tube tend to snap the ends of the melted link apart, giving a rapid arc extinction.

Distribution Cutout Rating		Contact Rating	Fuse Tube Rating	
KV	AMP	AMP	AMP	Interrupting Rating (RMS Amp.)
Type 33-D				
15	50	100	50	1200 4000
15	100	100	100	2000 4000
15	200	200	200	4000

Notes: 1. In a given voltage rating all Type 33-D fuse holders are mechanically interchangeable.

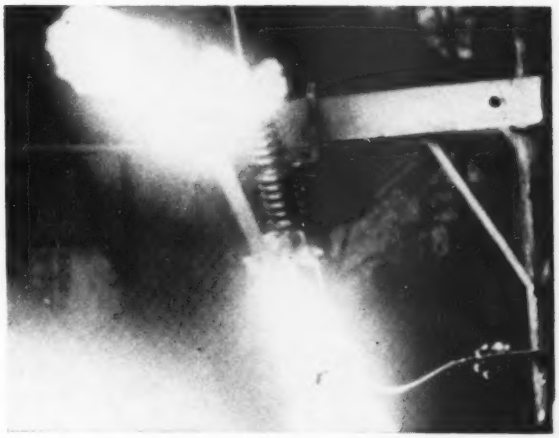
2. Continuous current or interrupting capacity can be changed in accordance with the above table by replacing fuse holder except in the case of conversion from a lower rating to 200 ampere rating, in which case the fuse mounting contacts must also be changed.

Distribution Cutout Rating		Contact Rating	Fuse Tube Rating	
KV	AMP	AMP	AMP	Interrupting Rating (RMS Amp)
Type H-33-D				
15	50	200	50	6000
15	100	200	100	9000
15	200	200	200	11000
Type HH-33-D				
15	50	300	50	8000
15	100	300	100	12000
15	200	300	200	16000
15	300	300	300	20000

Notes: 1. Continuous current or interrupting capacity can be changed in accordance with the above tables by replacing fuse holder. In a given voltage rating all fuse holders are interchangeable.

2. The Type H-33-D and the Type HH-33-D fuse mountings are identical except for contacts. The Type H-33-D has 200 ampere contacts and the Type HH-33-D has 300 ampere contacts.

3. All 50, 100 and 200 ampere fuse holders for both type cutouts can be applied in either cutout. The 300 ampere type HH-33-D fuse holder can be used in the Type H-33-D fuse mounting if the 300 ampere contacts are substituted for the 200 ampere contacts furnished in the Type H-33-D.

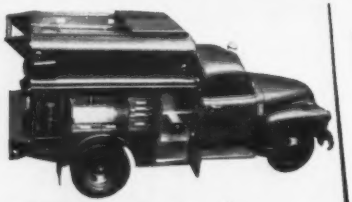


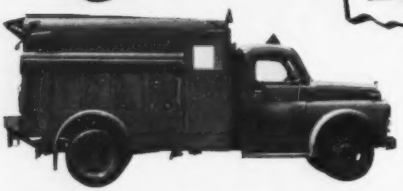
Southern States Equipment Corp.

HAMPTON GEORGIA

WORTH REMEMBERING...

You can get all HOLAN Line Body Models with or without a crew compartment!



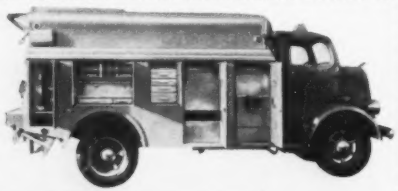


Model CL-112 (top) for light line work with a three-man crew.

Model CLC-138 has similar compartment arrangement plus a four-man crew compartment.

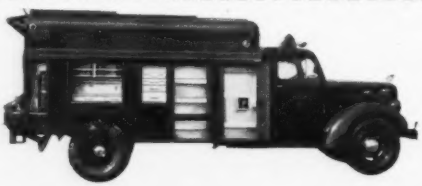
• Devote your entire line body to carrying tools, equipment and supplies . . . or carry your crew right along in a built-in four-man crew compartment. Whatever your procedure, Holan bodies meet the specifications . . . for light line work, medium line work, or extra heavy construction work.

Only Holan offers such a wide selection of line body models plus so many exclusive time and labor saving advantages.



Model CM-138 (top) for medium line work.

Model CMC-164 has the same compartment arrangement and a four-man crew compartment.



Model CH-156 (top) for heavy line construction and maintenance work.

Model CHC-182 has same compartment arrangement plus a four-man crew compartment.

The dependable name in Utility Bodies . . .

J. H. HOLAN CORPORATION

BODIES and ACCESSORIES for UTILITIES

4100 West 150th Street Cleveland 11, Ohio

Compare for Quality and Engineered Features

DISTRICT SALES REPRESENTATIVES

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DISTRIBUTORS

Baker Equipment Engineering Co.
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Charlotte, N. C.

A. & A. Supply Company
P. O. Box 769
Abilene, Texas

P. O. Box 1516
Albuquerque, N. M.

Schetky Equipment Corp.
1810 S. E. 10th Avenue
Portland 14, Oregon

You can profit

from Manchester's Experience

Quick, Easy Expansion with Westinghouse Network Transformers

Public Service Company of New Hampshire envisioned Manchester as a city sure to grow . . . power requirements certain to increase. That's why an underground secondary network system was installed . . . to give the flexibility needed to accommodate extensions, load shifts and future growth *economically.*

Already these predictions have come true. But the network system offered a simple solution. A number of new 500-kva Westinghouse Network Transformers were quickly and easily installed throughout the city.

Here's the transformer that offers greater savings in initial cost . . . and these *plus* features:

STANDARDIZED electrically and mechanically to meet industry requirements . . . to improve delivery and reduce costs.

CONTINUOUS WINDINGS with sliverless copper.

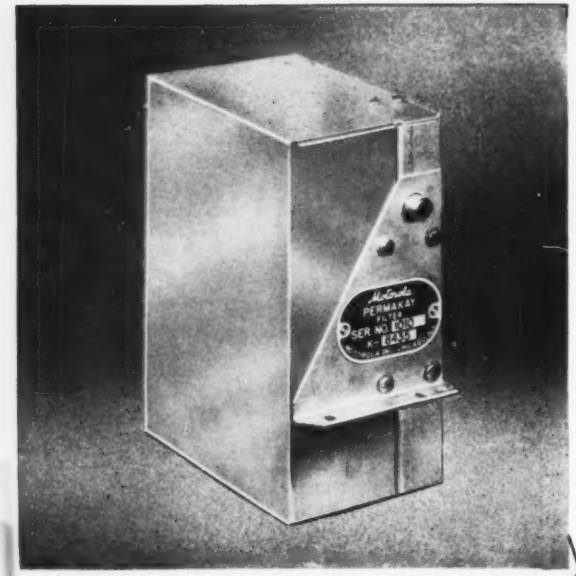
HIGH AND LOW-VOLTAGE COILS accurately centered to minimize short-circuit stresses.

SINGLE RESPONSIBILITY—transformer, network protector, rotary switch all supplied by one manufacturer.

Westinghouse helped develop the network system over 29 years ago and has continuously pioneered new developments. Complete facilities including board analysis and competent engineers can help with your system planning. Call your nearest Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70614

YOU CAN BE SURE . . . IF IT'S
Westinghouse

NETWORK TRANSFORMERS

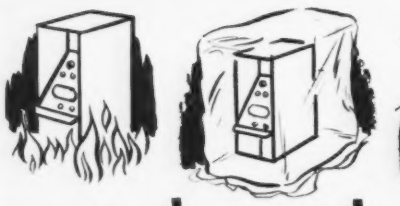


In Sensicon exclusive design the

Motorola Wave Filter removes 15 nuisance tuning adjustments

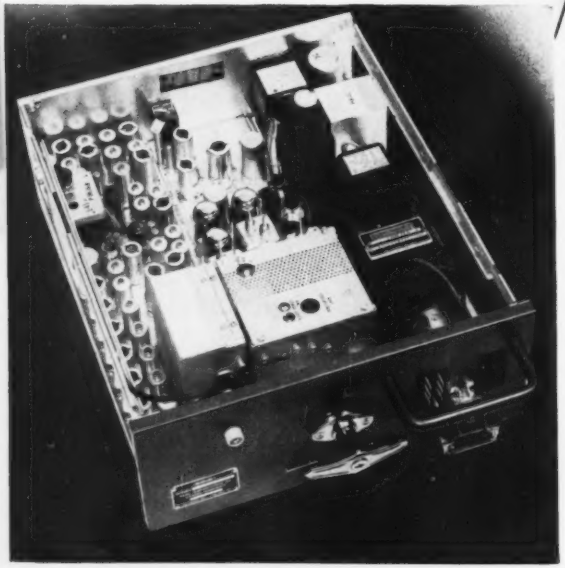
More tuned circuits and superior performance with *fewer* tuning adjustments in the SENSICON Receiver are achieved using the PERMAKAY IF Wave Filter. The modified constant-K, m-derived band pass filter contains 15 tuned circuits . . . BUT . . . you are not burdened with field alignment and complex tuning adjustments. The filter, tuned and sealed during manufacture, requires no further adjustments . . . *ever.* This combination provides over 100 db signal rejection at the *edge* of the adjacent channel while providing a broad bandpass at 6 db for full modulation deviation acceptance.

Motorola's unique Permakay system of linear phase shift adjustment solves the problem of reflection and pulse noise control to provide maximum signal-to-noise ratio for the phenomenally high interference-rejection.



DUST AND HEAT-PROOF | WATER AND COLD-PROOF | TAMPER AND SHOCK-PROOF

Motorola 2-way radio



and guarantees permanent selectivity

The PERMAKAY Filter characteristics are made permanent by casting the entire unit in a solid block of polyester-styrene plastic. Never can the precisely tuned circuitry be affected by water, dirt, heat, cold or mechanical shock. Temperature compensation insures constant performance even at extreme temperatures as demonstrated in all rigid laboratory torture tests. Motorola's *unconditional* guarantee of the PERMAKAY Filter for the life of the set again demonstrates that Motorola is still your best investment.

Over 22 Years of Leadership in Mobile Radio . . .

Year in and year out, Motorola installations number more than *twice* those of all other manufacturers *combined* and more than *five times* those of the nearest competitor.

Motorola

Communication and Electronics Division
4545 Augusta Blvd., Chicago 51, Illinois

Are you turning in all your SCRAP?

Don't wait for "George" to do it

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

IF you are a steel user, this important job of getting more scrap back to the mills is directly up to *you*. You just cannot afford to sit idly by while the scrap shortage gets worse. For unless everyone really pitches into this job of digging out all the scrap possible, steel production is bound to suffer, and every steel user, in more or less degree, will suffer too.

More scrap means *more* steel—it's as simple as that.

Right now some mills have only a bare two-days' supply of scrap on hand. Others have even less. Some steel-making furnaces already have had to shut down for lack of scrap. The situation is serious. Only you can help improve it.

By turning in every piece of worn-out equipment, every obsolete tool and machine, in fact every pound of iron and steel scrap you can comb out of your plant, you'll be helping relieve the worst scrap shortage since Pearl Harbor days . . . and the steel industry will be able to produce more of the steel you need.

Remember—it takes at least one-half ton of scrap to make one ton of steel. To maintain steel's present high production schedules requires more than 1400 carloads of industrial scrap *every* day. So turn in your scrap—ALL your scrap—and keep the mills rolling. This is more than a shortage. It's an emergency that vitally concerns you—and us—and the Nation.

This page would ordinarily be used to tell you about

AMERICAN ELECTRICAL WIRE AND CABLES

but, because without SCRAP we cannot produce steel, we are asking instead for your all-out help in getting more SCRAP to the mills.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

1-1348

UNITED STATES STEEL

ACSR—First "Line" of Defense

TODAY, in order to meet critical defense needs, more and more aluminum is going into power transmission.

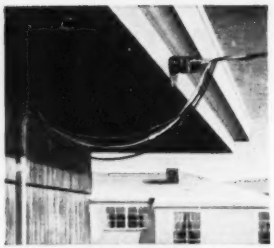
This recognition of aluminum electrical conductor is supported by its overwhelming acceptance by the power industry—today, more than 80 per cent of all transmission lines being built are aluminum.

For these dollars-and-cents reasons: Lower material cost compared with copper. The strength-ratio weight of aluminum electrical conductor cuts installation costs by making possible longer spans, less sag, lower towers. Its great corrosion resistance means long life, less maintenance costs. Less corona cuts power loss. And reserve capacity can be built in at lower cost.

Our service engineers will gladly work with you on your electrical conductor problems! Call us today!

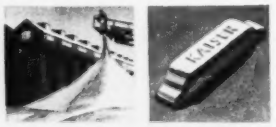
Sales offices in principal cities. Kaiser Aluminum & Chemical Sales, Inc., Oakland 12, California.

Also distributed by: General Electric Supply Corporation, Line Material Company, Mine & Smelter Company, Tafel Electric and Supply Company, Westinghouse Electric Supply Company.



OTHER COST-SAVERS! Kaiser Aluminum triplex service drop cable combines three wires in *one* assembly—needs fewer accessories. Kaiser Aluminum Weatherproof Wire—neoprene or polyethylene covered—also offers cost and operating economics.

HIGHEST QUALITY—Our production personnel have had long experience in cable making, employ the finest new production facilities. Cable is tested by the most modern instruments.



DEPENDABILITY—Our continuing supply of conductor is based on completely integrated facilities—from bauxite to finished ACSR.

TECHNICAL ASSISTANCE—For help on your conductor problems, call any Kaiser Aluminum office. It's listed in your local classified telephone directory.

Kaiser Aluminum

Setting the pace . . . through quality and service

GOULD

Plus-Performance Plan

REGULAR WATER ADDITIONS

ADD MONTHS TO BATTERY SERVICE!

The amount of water used by a battery indicates its general condition. That's why regular, systematic watering is so important to maximum battery service. The GOULD PLUS-PERFORMANCE PLAN gives you complete technical information, not only on how to establish a regular watering routine, but on practically every problem connected with storage battery use.

Comprising manuals, articles, specifications, bulletins, charts, graphs and forms, the GOULD PLUS-PERFORMANCE PLAN tells you how to select, charge and handle, maintain and determine the condition of your batteries. Use it consistently and you can improve your battery performance as much as 50%! All material is free. A request will bring descriptive booklet by return mail.

Gould Planté—
The Aristocrat of
Stationary Batteries

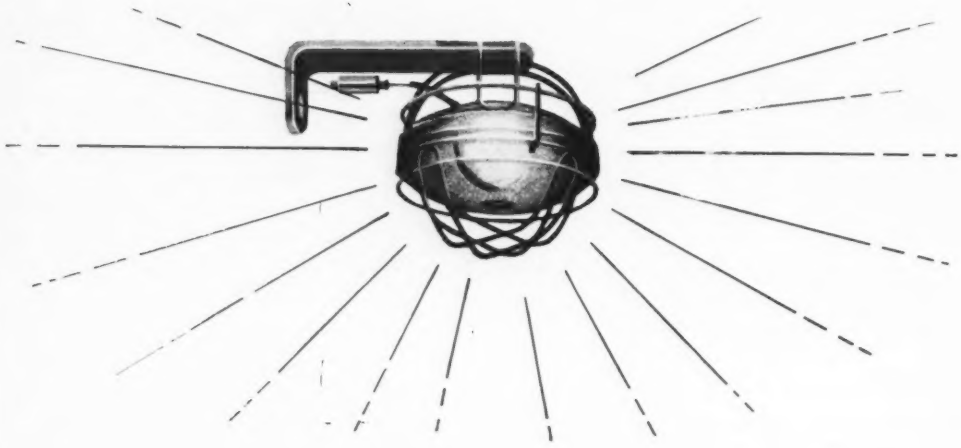
WATERING ROUTINE VITAL TO MAXIMUM STATIONARY SERVICE

As a rule, stationary batteries do not need water more than semi-annually and this period may even extend to a year before electrolyte levels drop below the low level mark. Always use distilled water and when adding, do not pass the high level mark as subsequent gassing during equalizing charges may cause cell tops to become wet. If electrolyte levels fall below the tops of the plates all such exposed areas become inactive, putting excessive loads on the submerged portions. Loss of battery life results. Furthermore, exposed portions of the wood separators tend to dry out and shrink—internal resistance increases and voltage during discharge is reduced.

GOULD **STORAGE BATTERIES**

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, NEW JERSEY

Always Use Gould-National Automobile and Truck Batteries



THE FIRE WATCH THAT NEVER SLEEPS

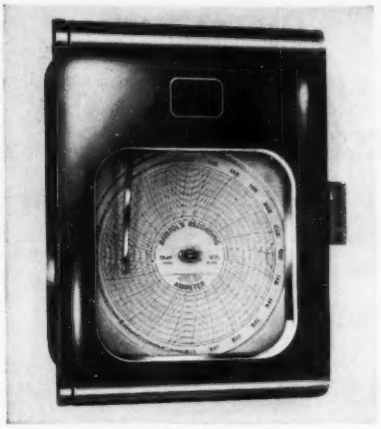
ARE you ready for fire *when* it strikes? Week ends? Nights? During shut downs? Put a Kidde Automatic Fire Extinguisher System on the job—it's *always* on the alert against fire.

The heat from a fire hits the Kidde detector . . . sends a signal that releases flame-smothering carbon dioxide automatically. Such a system can protect a single space . . . or many spaces throughout the plant.

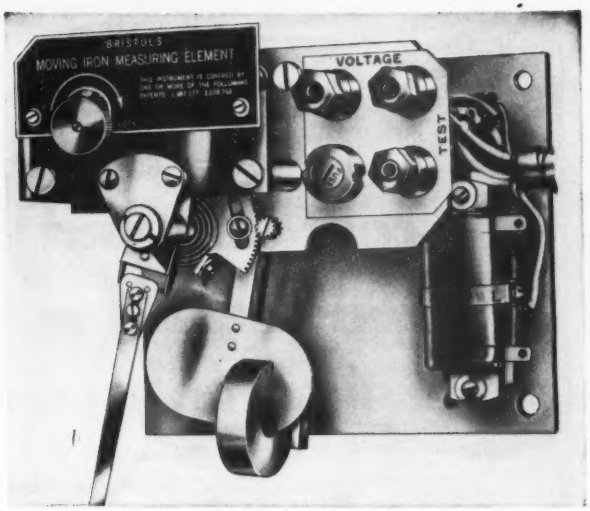
Wherever a hazard exists—in engine rooms, fuel storage rooms, document vaults, electrical equipment—you can depend on fire-sensitive, fast-acting Kidde automatic or manual systems to protect your property. Call on us for full information.

Kidde

Walter Kidde & Company, Inc., 1030 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.



PERMANENT MOUNTING offered in three models: interchangeable surface and flush, surface-panel and flush panel. Note the pleasing, well-balanced appearance. Also: **PORTABLE INSTRUMENTS** are offered in two models: for setting on floor or table; for mounting on walls or poles and general service.



NEW MOVING-IRON MEASURING MECHANISM. High torque, low burden, rugged construction for assurance that the original calibration will be retained through years of service. Shock-absorbing stainless steel bearings.

NEW BRISTOL Series 500 RECORDING VOLTMETERS and AMMETERS

THE LATEST DEVELOPMENT IN ELECTRICAL MEASUREMENT

Outstanding for—High actuating torque... Low electrical burden... Stability of calibration... Dependable accuracy

Here is electrical measurement at its finest . . . most dependable . . . most convenient to use—the product of nearly 60 years of experience in building recording voltmeters and ammeters for almost every application.

The new moving-iron measuring mechanism is a type known for high actuating torque and low electrical burden . . . refined by Bristol engineers for greater accuracy and ruggedness.

Other Bristol developments that assure convenience in use include the new Series 500 dust- and moisture-protected die-cast aluminum case, quick-set chart hub for easy chart changing, non-obscuring pen lifter, snap-on chart plate.

To keep up with the latest in recording instruments, send for Bulletin E1111, addressing THE BRISTOL COMPANY, 116 Bristol Road, Waterbury 20, Conn.

THE DEPENDABLE GUIDEPOST OF INDUSTRY

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

NOW... practical, low-cost demand metering of even small kw loads!

SINGLE OR POLYPHASE CIRCUITS

To help you achieve all-important economy in the metering of kw demand, Westinghouse continues to develop and improve devices for every application in this field. The result is . . .

A complete line of kw demand type equipment . . . one that fulfills all of your present needs and anticipates many of your future requirements!

The improved CSH single-phase meter and the new CSH-8 polyphase unit (illustrated here) are typical examples of the way Westinghouse pioneers to produce savings for you. Into the CSH meter have gone many new improvements to make it easier, and more practical for you to measure demand on single-phase loads. And the new CSH-8 is the first thermal demand unit available in a socket base for polyphase circuits. Both units combine standard watthour meters with practical thermal demand meters—in a single case—to answer your need for low first cost . . . lower installation and maintenance costs.

In the complete line of Westinghouse metering equipment you'll spot many opportunities for savings. So whether your needs involve large loads or small, single or polyphase circuits, kw or kva, call on Westinghouse.

For complete information on CSH Meters write for Catalog Sections 42-337 and 42-338. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40394

YOU CAN BE SURE.. IF IT'S
Westinghouse
METERS

NEW!

Type CSH-8 socket-type, combination watthour and thermal watt demand meter for polyphase circuits.

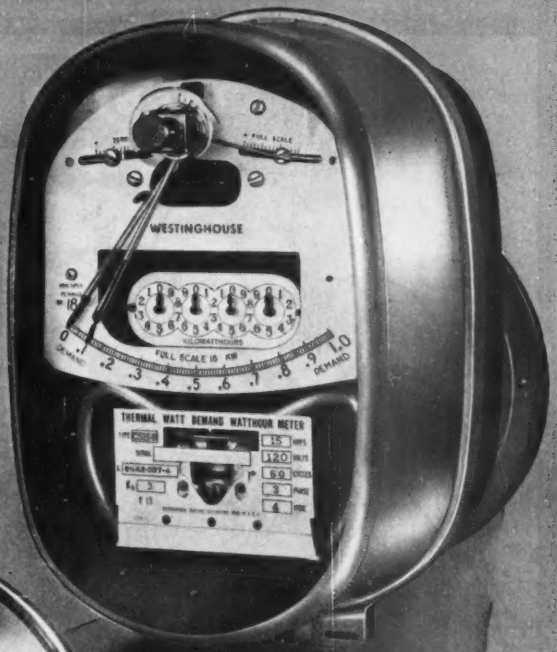
SIMPLIFIED INSTALLATION One mounting for both watthour and thermal demand meter.

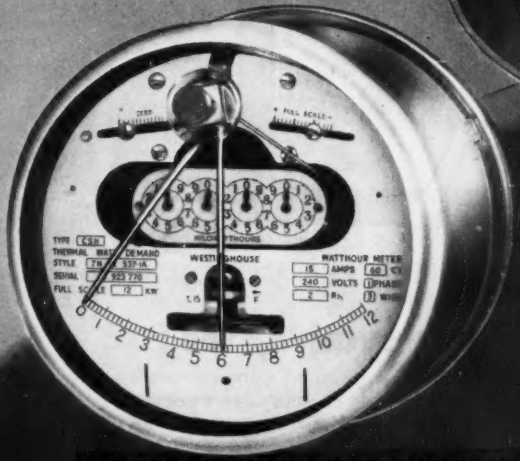
LOW MAINTENANCE Simple thermal action provides same low-maintenance characteristics as standard watthour meters.

MINIMUM SIZE Over-all dimensions are the same as for a three-element watthour meter except for the increased depth of the demand-type cover.

IMPROVED!

Type CSH combination watthour and thermal demand meter for single-phase circuits. Now available —high-capacity, 50-ampere, 240-volt, 48-kw demand.





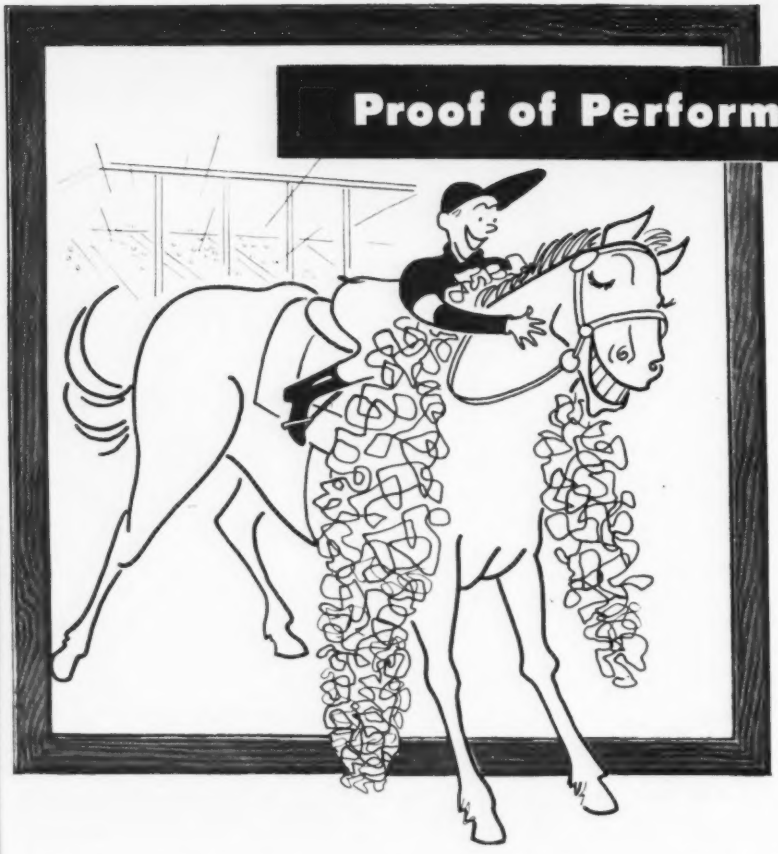
THERE'S A WESTINGHOUSE METER FOR EVERY APPLICATION!

Recording kilowatt demand meters.

Block interval, indicating and accumulative demand registers.

Single or polyphase combination watthour and thermal watt demand meters.

Switchboard-type combination thermal watt demand meters.



demand it in your wood preservative, too!

There's only one way to take the guesswork out of specifying a wood preservative. That's by judging the various preservative materials in terms of service records compiled in actual use.

And when it comes to service records, Creosote Oil is in a class by itself. Factual data on the performance of Creosote Oil has been gathered over the last 70 years. Its effectiveness is a matter of proof, not promises.

Many service tests have centered around U·S·S Creosote Oil. And it has consistently demonstrated—in actual service—that it has the toxicity and permanence needed for satisfactory results.

For immediate shipment of U·S·S Creosote Oil by rail or river from our Clairton, Pa., plant, get in touch with the sales office nearest you. For quality and service, you can rely on the U·S·S label. United States Steel Company, 525 William Penn Place, Pittsburgh 30, Pa.

USS

U·S·S CREOSOTE OIL

UNITED STATES STEEL

Memo to:
UTILITY SALES STAFFS

Your productive SALES IDEA...

-Electric Range Activity

-Electric Kitchen Promotion

-Commercial Electric Cooking Activity

-Electric Water Heater Activity

-Electric Dishwasher Activity

. . . can be a prize winner in the

1951 HUGHES AWARDS!

Your Company may be using or planning an effective sales idea which has proved successful in solving a major appliance merchandising problem in your area. Why not give it an opportunity to gain recognition for you or your company in the 1951 Hughes Award Competitions? Duplicate prizes are to be awarded to both large and small companies. Hughes Awards brochure gives complete details.

The Hughes Awards for 1951 will be based on productive sales ideas regardless of the size of the company or conditions in the territory served. The winners will be the individuals and/or companies submitting the most constructive selling methods relating to the activities shown above. Elaborately prepared entries will have no advantage over simple, documented case-histories of successful sales programs.

Arrange now to enter the promotion plan or sales campaign that helped your Company bring some worthwhile electrical servant into the homes of your area.

The 1951 Hughes Award Brochures have been mailed to Electric Operating Utility Companies.
If you need additional information write to
Edison Electric Institute,
420 Lexington Avenue,
New York 17, N. Y.

UTILITY DIVISION

Hotpoint Inc.
(A General Electric Affiliate)
5600 West Taylor Street, Chicago 44, Illinois

WESTON RELIABILITY

in instruments of

High Sensitivity

For the critical measurements encountered in nuclear research, electronics or in general test procedure, WESTON supplies a broad line of instruments in types and sizes for all requirements. All embody true WESTON precision and dependability; and all D-C, rectifier type A-C and RF instruments have inbuilt magnetic shunts which permit minor field adjustments if necessary. Complete information is available from the WESTON representative near you, or direct; and full cooperation on special instrument requirements is freely offered. Weston Electrical Instrument Corporation, 594 Frelinghuysen Ave., Newark 5, N. J., manufacturers of Weston and TAGliabue instruments.

WESTON *Instruments*

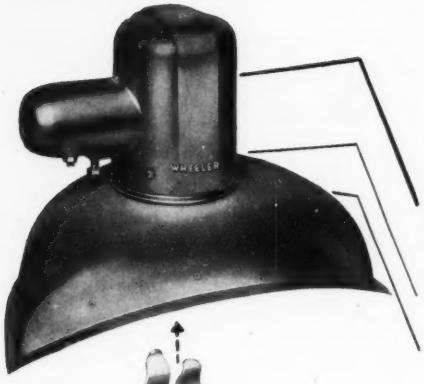
Wheeler

MULTIPLE ADVANTAGES AND ADVANCES IN STREET LIGHTING

New!

- ***A UNIDIRECTIONAL LUMINAIRE***
- **for DEAD-END STREETS**
- **for T-INTERSECTIONS**
- **for *STREET* BENDS —**

IN ADDITION TO STANDARD IES TYPES I AND II



WHEELER Cat. No. 3900 LOW VOLTAGE HEAD with Bayonet MULTIPLE Receptacle on NO-SLIP Adjustable Socket Support.

WHEELER Screw Ring Reflector attachment permits optional filament shielding.

WHEELER Cat. No. 5321 CRESCENT REFLECTOR with normally visible filament position and stainless steel Edgeflectors. The FIRST satisfactory Type II "Helmet" Reflector.

WHEELER Cat. No. 2717 MEDIUM BASE SOCKET — BAYONET TYPE TO TAKE YOUR SERIES LAMP PULLER

View showing Edgeflector.

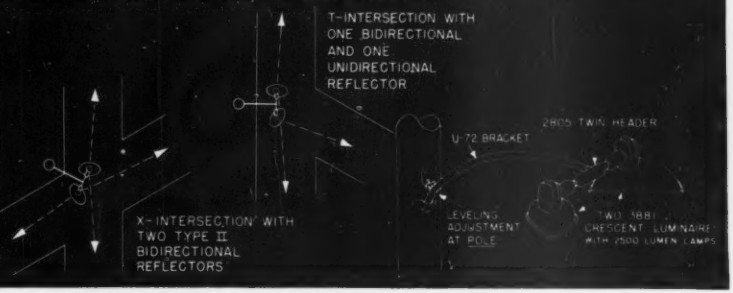
FOR COMPLETE INFORMATION
write to:
STREET LIGHTING DEPT.
WHEELER REFLECTOR CO.
275 Congress St. Boston 10, Mass.

ANNOUNCING

The FIRST system ever devised for efficient residential street lighting. Twin Type II units, either bidirectional or unidirectional, for high utilization factors in all kinds of street configurations — using Wheeler Cat. No. 2805 Twin Bracket Header.

SEE DIAGRAMS AT RIGHT →

- ★ Intersection Lighting with Standard Type II Luminaires
- ★ No dark intersection if one lamp burns out
- ★ Profitable Business — Revenue from two lamps on one bracket
- ★ House shielding at Intersections
- ★ Low Cost equipment for 5000 Lumen installations

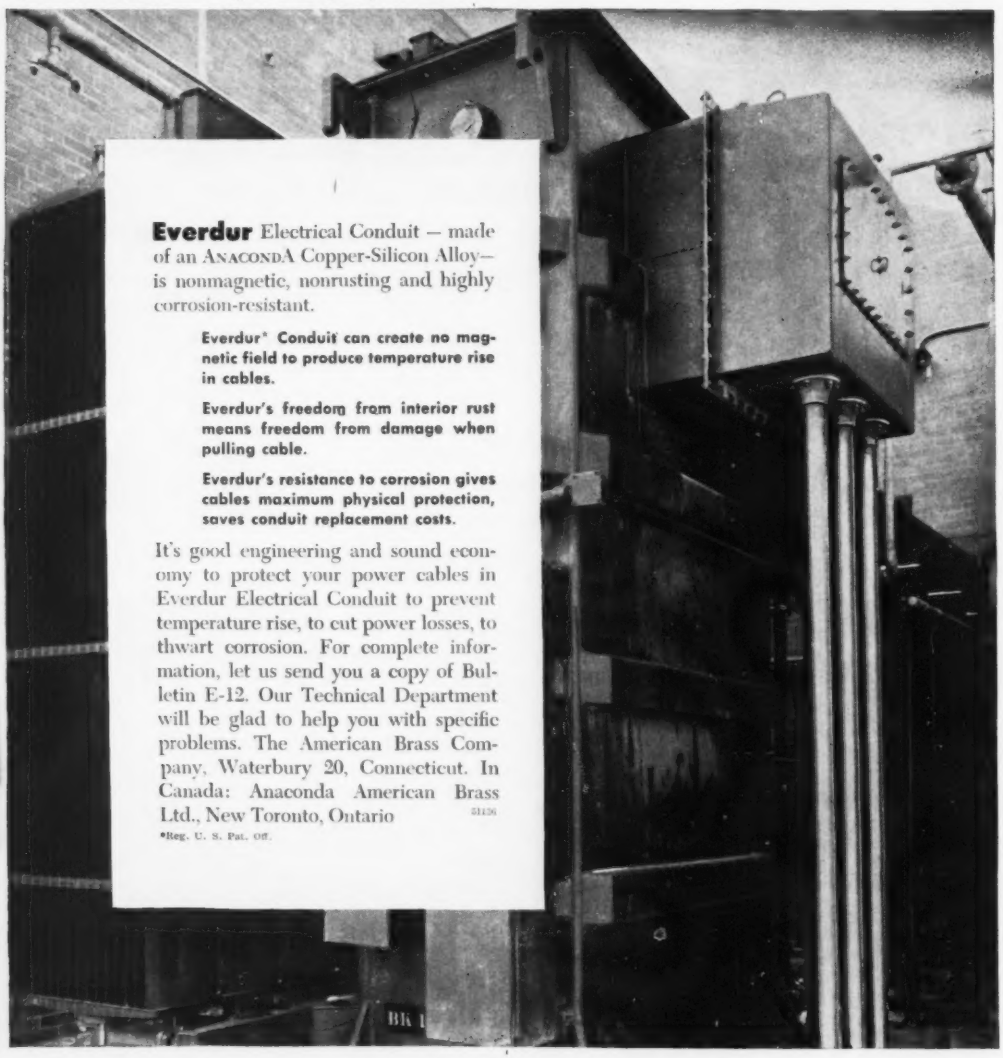

T-INTERSECTION WITH ONE BIDIRECTIONAL AND ONE UNIDIRECTIONAL REFLECTOR
2805 TWIN HEADER
U-72 BRACKET
LEVELING ADJUSTMENT AT POLE
TWO 1881 CRESCENT LUMINAIRES WITH 2500 LUMEN LAMPS
X-INTERSECTION WITH TWO TYPE II BIDIRECTIONAL REFLECTORS

STREET Wheeler **LIGHTING**

SPECIALISTS IN SKILLED LIGHTING EQUIPMENT SINCE 1881

EVERDUR—The non-ferrous cable conduit for full electrical and physical protection

Everdur Electrical Conduit installation to junction box of a 7,500 kva transformer at Dunkirk, N. Y., Steam Station of Niagara Mohawk Power Corp. Each conduit contains 1-conductor cable carrying 300 amperes at 13,800 volts. Separate conduits provide complete phase isolation.



Everdur Electrical Conduit — made of an ANACONDA Copper-Silicon Alloy— is nonmagnetic, nonrusting and highly corrosion-resistant.

Everdur* Conduit can create no magnetic field to produce temperature rise in cables.

Everdur's freedom from interior rust means freedom from damage when pulling cable.

Everdur's resistance to corrosion gives cables maximum physical protection, saves conduit replacement costs.

It's good engineering and sound economy to protect your power cables in Everdur Electrical Conduit to prevent temperature rise, to cut power losses, to thwart corrosion. For complete information, let us send you a copy of Bulletin E-12. Our Technical Department will be glad to help you with specific problems. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario 5126

*Reg. U. S. Pat. Off.

wherever corrosion resistance counts — consider

EVERDUR ELECTRICAL CONDUIT

ANACONDA®

±10% Regulation... in Sixteen 1¼% Steps

with New URL-16 Voltage Regulator — An Important Addition to the URL-8 Line

ASSURES MORE REVENUE FROM HEAVILY LOADED RURAL AREAS

Here's a new, low-cost answer to economical regulation in rural or suburban areas . . . at the substation or on the line. This new regulator increases the "URL" line for application in locations where a 10% range is not sufficient, and where a ±10% regulator is required. Sixteen 1¼% step operation meets these requirements under any load condition, at minimum cost.

Check these moneysaving features:

10% Regulation, Raise and Lower, in 16 Steps of 1¼% Each—Combines light weight for single-pole mounting with regulation for substation application. A double-purpose feature that cuts costs. Regulator retains every outstanding "URL" feature.

Simple Tap Changer, with Reversing Switch for ±10% Regulation—Cuts maintenance. Assures positive arc interruption and minimum voltage variation during tap changing period.

Package Control Mounted in Improved Control Cabinet—Operating relays are mounted in flexitest chassis. Separate resistance and reactance line drop compensator provides rated line drop compensation with regulator carrying only 67% rated load. All mounted in a cabinet with door hinged to provide workbench when fully opened.

For Further Information, call your Westinghouse representative, or write. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70602

YOU CAN BE SURE... IF IT'S Westinghouse

VOLTAGE REGULATORS

HERE'S THE ANSWER

to your questions about

REYNOLDS ACSR...

Since the Reynolds Metals Company entered the ACSR field, there have arisen some understandable questions concerning the company and its product. Let's look at these questions . . . and the answers to them!

Q. Does Reynolds know the cable business and are they in it to stay?

A. Reynolds has been in the cable business for about 2½ years. In that time we have constructed and put in operation a new multi-million dollar cable plant, with an annual capacity of 50,000,000 pounds of ACSR. Furthermore, we developed and introduced the Master Reel and Coil to eliminate reel handling problems and to cut stringing costs – the first major improvement since the advent of wooden reels. Doesn't that look like we know our business and are in it to stay?

Q. What about the technical qualities of Reynolds ACSR?

A. Thorough testing by men with years of experience assures a conductor of uniformly good quality. For instance, each lot of aluminum is carefully analyzed to insure maximum conductivity . . . steel core properties are controlled by rigid specifications . . . continuous inspection of finished cable minimizes erection and maintenance troubles—assures full strength to meet the most rugged service conditions.

Q. How does Reynolds ACSR compare in cost per mile?

A. Even with the smallest sizes, typical Reynolds ACSR installations save as much as $90.00 per mile—sometimes even more. Because ACSR weighs less than other types of cable in electrically equivalent sizes, fewer poles per mile are required and stringing is faster.

Q. Can we depend on Reynolds for supply?

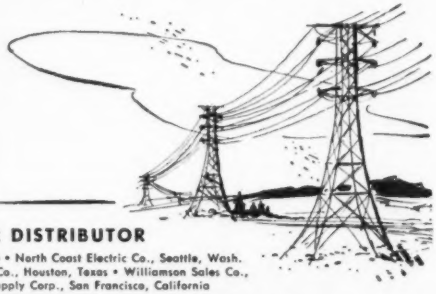
A. Because *all* of Reynolds' facilities—from bauxite to the finished ACSR—are completely integrated . . . and because Reynolds has embarked on a huge new expansion program that assures a production capacity of 650 million pounds of aluminum by 1952 . . . you can depend on Reynolds for your ACSR, if government regulations will permit.

Q. Does the Reynolds man who sells me know his business?

A. Every Reynolds salesman is qualified in the field in which he sells. He brings you the necessary experience and show-how. And behind him, ready to offer you *complete* planning assistance, is the trained staff of Reynolds Technical Service.

Q. How can we get complete information on Reynolds ACSR—sag and tension data, for instance?

A. Send today for your free copy of Reynolds' "ACSR Manual for Engineers." Contains helpful information, complete charts and tables in a loose-leaf binder. Additional data will be sent you whenever new information is available. Write on business letterhead to Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.



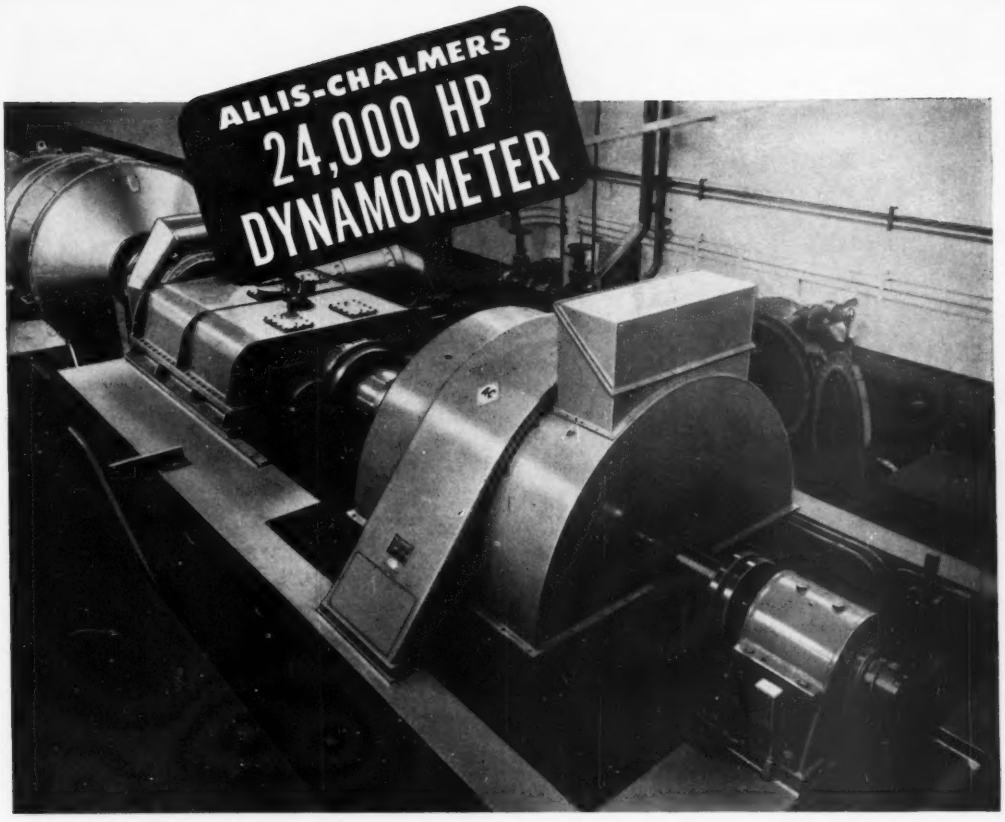
SEE YOUR REYNOLDS ACSR DISTRIBUTOR

Westinghouse Electric Supply Co., New York, N. Y. (And branches) • North Coast Electric Co., Seattle, Wash. Griffin Manufacturing Co., Dallas, Texas • Southern Electric Supply Co., Houston, Texas • Williamson Sales Co., Shreveport, Louisiana (And branches) • California Electric Supply Corp., San Francisco, California

REYNOLDS METALS

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND



Another Example of Allis-Chalmers Engineering

DESIGNING AND BUILDING this special power-delivering dynamometer required engineering skill available only to a company such as Allis-Chalmers with its century of engineering experience.

Arranged for direct measurement of torque, the dynamometer has an accuracy of ½% of the rated torque. Its overall speed range is 1210 to 15,072 rpm. And the 24,000 hp synchronous motor and its speed-increasing gear are supported by a special hydrostatically mounted base. Although the assembly weighs 130,000 pounds, it is so well balanced and cradled that it can be moved by the pressure of a man's finger.

The dynamometer was built for the Pratt & Whitney Aircraft Division of United Aircraft Corporation for testing turbo-jet engines. Allis-Chalmers also supplied the torque measuring equipment, metal-enclosed bus duct and switchgear.

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Whether you require an addition to an existing power line, or a complete installation to service an expanding area, you'll find it worthwhile to put your tower requirements up to Bethlehem.

Our designers, with years of transmission-tower work behind them, can embody your requirements in an efficient design. Our trained shop men know tower-fabrication from A to Z. And Bethlehem fabricating shops are well located, and are equipped for every step of manufacture, including galvanizing.

We'll be glad to offer recommendations for your next tower job, regardless of location. To start the ball rolling, drop a line to the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY
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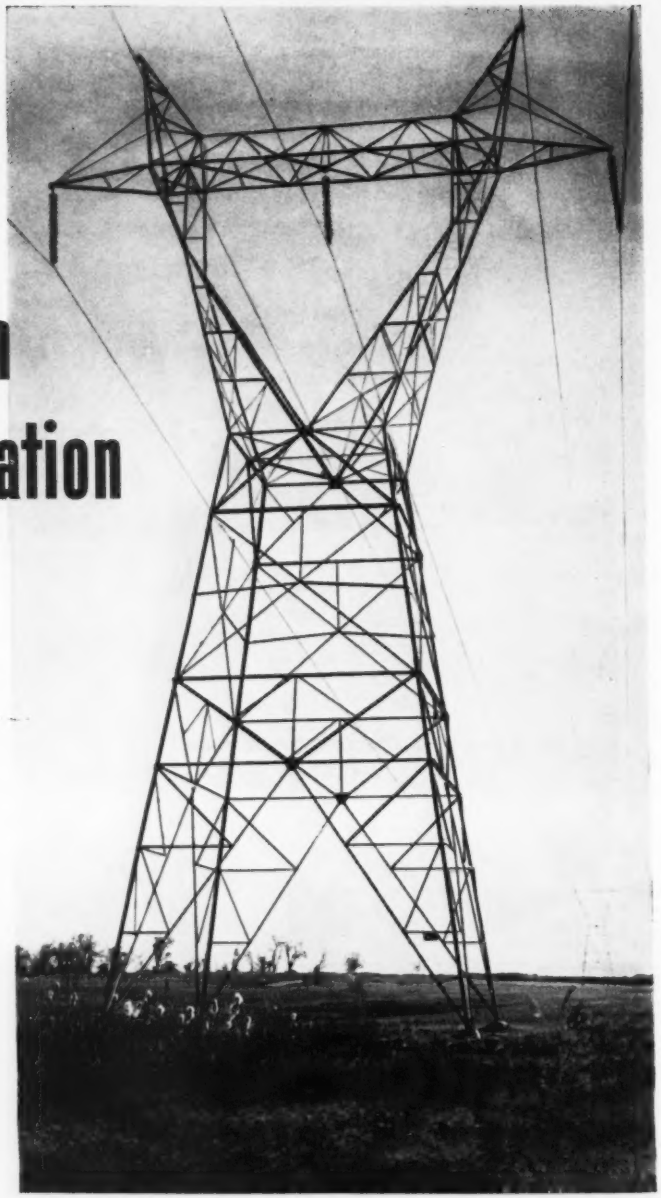
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



One of a group of 430 suspension towers designed and fabricated by Bethlehem for the U. S. Bureau of Reclamation Oroville-Sacramento Line, part of the California Central Valley Project Lines. This 230-kv single-circuit Type SL tower is 95 ft high. Conductors are 795,000 cm ACSR.

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Write for Bulletin TU 1-8.

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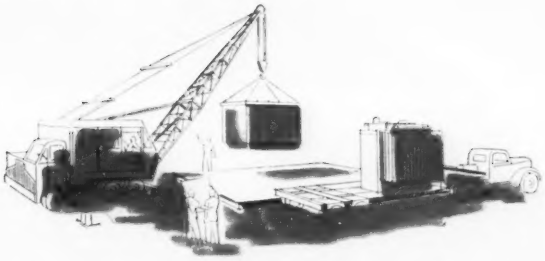


Consolidated Edison installs another Westinghouse Unit Substation . . .

for lower, long-range distribution costs!

Con Edison's expansion program aims at *long-range* distribution economy. That's why —wherever possible—they utilize modern unit substations. And what they have to say about a recent Westinghouse installation indicates how conveniently they—*and you*—can attain this objective.

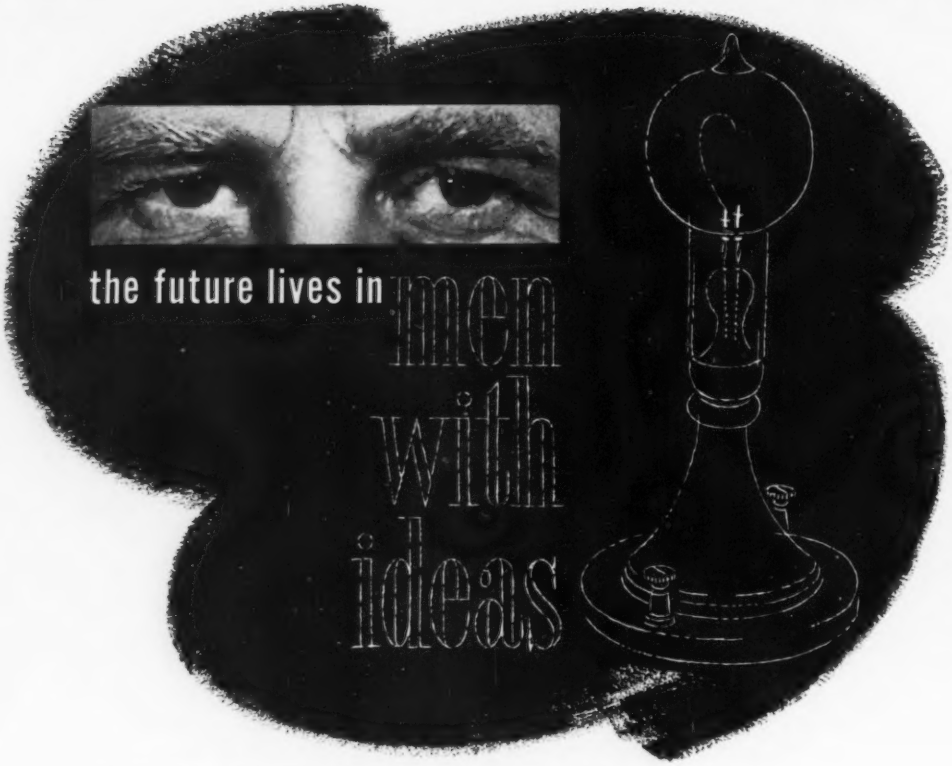
> "Its compact, factory-assembled design enabled us to immediately realize savings in real estate costs, in preparation of the installation site and in the actual installation itself. Also, it is contributing to better electrical service by improving voltage conditions. Most important, its flexibility and low-cost maintenance features will enable us to *economically maintain* high standards of service in an area where considerable load growth is anticipated."

Con Edison enjoys these benefits because Westinghouse Unit Substations are specifically designed to meet today's power distribution problems. "Unitized" construction enables you to add "blocks of power" to accommodate increased load requirements. And they're available in types to serve the most modern distribution systems.

For complete information, get your copy of Booklet B-4061. Ask your Westinghouse Representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-60758

YOU CAN BE SURE... IF IT'S Westinghouse

UNIT SUBSTATIONS



The miracles of modern electric illumination were all foreshadowed by the glow of Edison's first lamp—implicit in the great IDEA. Also implied in this, as in all epoch-making inventions, were the corollary imagination and effort of thousands of unpublicized successors—pioneers of America's vital electric illuminating industry.

KERITE insulation was well established before the turn of the century. Already famous in telegraphic and signal applications, Kerite quickly won recognition for safety, dependability, and ultimate economy in the infant lighting and power industry . . . for the transmission of electric power via aerial, underground, and submarine cable.

By conscientious workmanship, careful handling, and a continuing search for new and better applications of its unique formula, The Kerite Company has been able to anticipate the power industry's needs. It will continue to apply itself to the technical world of "ideas" in which now, as in Edison's day, the future of America's power still lives.

KERITE CABLE

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Editorials

Mr Chapman Won When He Lost

Only six months ago the federal power advocate, Interior Secretary Oscar L. Chapman, overruled James F. Fairman, Depa administrator, on the location of aluminum production capacity in the Northwest regardless of the potential shortage of power. The sponsorship of more aluminum capacity in this area was not just to assure cheap power. It was part of a plan to expand the foothold of federal power in the Northwest.

Today Chapman is sponsoring the addition of 400,000 kw of fuel-burning generating capacity to firm up the hydro power. We guess that tomorrow more load will be placed in the area to justify additional generating plants for the Bonneville system.

The story begins with Chapman's memorandum stating that "In planning the expansion of defense industries, the location of which is dependent upon power suppliers, it will be our basic assumption during the emergency period and until new capacity can be added that median or probable water conditions shall be used to determine the power resources available for new industrial expansion." Depa had followed the more sensible course in turning down more aluminum load in the Northwest because of the shortage that would materialize under adverse flow conditions. Today we have those conditions, and Chapman's "calculated risk" theory has backfired as power experts foresaw and feared.

But the power shortage in the Northwest is not going to slow down or change present plans for more aluminum capacity there. It just gives the federal power planners an excuse to go to Congress for funds to add 400,000 kw of steam and gas turbine generating capacity. It happens that other areas are having their units pushed back in the schedule to the tune of several million kilowatts because of material shortages. But even this is ignored by Chapman in sponsoring more generating facilities for the Northwest.

Electrical World has always maintained the position that the price of aluminum is not sacred. While copper goes from 16c to 24c a lb, aluminum is held to a change from 17c to 19c a lb. Today, the price advantage favoring use of aluminum is recognized throughout the electrical industry. A substantial factor is the use of subsidized federal power.

Each of the present producers of aluminum has built economical plants in other sections of the country. But in order to remain competitive with each other, they must maintain some production in the subsidized power areas.

So it looks as if the Chapman plan will win in the end even though his calculated risk in the Northwest has backfired.

Appliance Selling and Utility Allocations

What should be done with electric appliances not yet in users' hands? Should all the ranges, refrigerators, washing machines, freezers, et al, now in dealer inventories and manufacturer's stocks, plus those coming off the assembly lines, be loaded on barges, towed out into the ocean, and sunk beneath the restless waves? In some thinking, these goods, as they affect the loads on electric utility systems, should somehow be kept from their destined purpose.

How else can be explained the incident related in our "Washington Comment" column of Sept. 10? An allocations arbiter reached down into his briefcase anl hauled up a full-page newspaper advertisement of electric appliances, a utility advertisement. In so doing, he stymied the argument of a claimant agency for larger allocations of materials for power system expansion. To him, it was obvious that the utilities wanted more materials simply to build up their businesses. He was firmly against such activity.

During World War II, the manufacture of household electric appliances was stopped entirely. The utilities accepted that without a murmur. They knew where their duty lay. The present emergency has not yet reached such a stage. We all hope it never will. Production of appliances continues. In a letter to stockholders, Gwilym Price, Westinghouse president, estimates consumer goods volume this year as only slightly under that of last year. But 1950 production was so high that a slight decline still leaves output at a high level.

These goods must be sold. They are not now being bought as avidly as two or three years ago. That means more effort must be put into selling them. If they are not sold disaster descends upon the important segment of the national economy they represent—not to speak of the tremendous waste of the costly labor and the scarce materials that are bound up in them.

These goods must be sold. They will be sold. What does it matter who sells them? An electric range adds as much to the utility peak load whether it is sold by the utility or by the appliance dealer on the corner. Until and unless we are forced by dreadful emergency to stop making electric appliances, no one should imply moral obliquity in the selling of them.

Resuscitation

The Schafer prone pressure method of resuscitation of a victim of shock, asphyxiation, or submersion has had a long record of success in saving lives. Within the last 20 years the Oesterreich pole top method has added to the fine record of life saving. Thousands of utility employees have been trained in the applications of either or both methods, and they, in turn, have been helpful in spreading the program to schools, Boy Scouts, and police and fire departments. Hard work has also familiarized the medical profession with merits of artificial respiration on the spot of the accident.

Now there is a threat arising to the eminence and practical universality of the Schafer method. The threat does not come at all from the medical laboratories of the universities but from a new quarter. It is reported that the defense forces, Red Cross and YMCA as a group are disposed to favor some other method to apply in the armed forces and in civilian defense. The objections they raise are valid enough mechanically because they argue that neither of the two methods provides positive action for getting air back into the lungs after the pressure phase of the resuscitation has expelled it. The weakness, on the other hand, in the skeptical group is that they would probably have difficulty citing any method which has demonstrably saved as many lives as the Schafer and Oesterreich techniques.

There will be conferences shortly, and the other groups should know that the electric power industry without having at all a closed mind on the issue will be asking for definitive proof. This is literally a matter of life *or* death because incontrovertible statistics show that adherence to the two established systems has been a matter of life *instead* of death on a large scale.

Hails on the Road

"Hi ya, Mista Couch!" That shout has echoed in the ears of the writer of this piece through the years since he rode along a dusty country road with the late Harvey Couch, then president of the Arkansas Power & Light Co. The memory persists because it was accompanied by a wide wave of the arm and the friendliest grin the human face can assume. They came from a Negro farmer who had turned his mules out from the narrow road to let the car pass. And all three, the greeting by name, the wave, and the grin, were returned by Mista Couch as the car went by. From this incident came a feeling that the company headed by this man must be on the best of terms with the people it served. A company is the shadow of a man.

The impulse to put this reminiscence into print had been slowly building up over some months. It resulted from reading publications put out by cooperatives for their members, several of which come to the editorial desk. Modest and unpretentious, most of them, usually four-letter size pages, they all have a common characteristic in greater or less degree. It is neighborliness, friendliness in personal terms, the same as on that dusty road in Arkansas.

We didn't know Harvey Couch very well, not well enough to be sure that the impression we got that summer afternoon truly represented the public feeling towards him and his company. We don't know Cecil Holsing, at all. But from frequent reading of his "Manager's Letter" in the "Goodhue County REA Reflector," we can easily hear, even at this distance, shouts of "Hi, Cecil!" as he drives along the Minnesota roads. It makes no difference if we are right or wrong in either case. One thing is certain. Neither power companies nor cooperatives can have too many friends.

The Electrical Week

INDUSTRY MOBILIZATION (Page 109)—Wilson report indicates industry will install 7 million kw this year . . . International copper allocation for fourth quarter gives U. S. little more than in past . . . Lead shortage is becoming acute . . . First thing industry agencies did when they got materials allotments for first quarter '52 was make plans to appeal them . . . Where utilities can get information about material allotments and construction is explained on p 108.

WASHINGTON—Who will redevelop the Niagara? Congress must choose among the federal government, the State of New York, and a group of private companies (p 104) . . . Truman delays nominating successor to Mon Wallgren as FPC member (p 106) . . . BPA's plan to add thermal plants in Northwest meets with opposition (p 107) . . . Truman still hopes Quoddy project will be revived (p 107) . . . Interior lets $17-million contract for Eklutna, Alaska, 30,000-kw hydro project (p 111).

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Latest from Washington—House Public Works Committee votes 15 to 9 to approve federal construction of 400,000 kw of thermal plants in Northwest . . . House-Senate conference ends in boost in corporate tax rates of five percentage points . . . Dr James Boyd quits as Bureau of Mines director to join Kennecott Copper executive staff . . . W. G. Trupner takes over direction of CMP office, replacing W. C. Skuce who returns to Owens-Corning Fiberglas Corp . . . Governors of Oregon and Washington have been asked to extend daylight saving time another month by Mobilizer Wilson and Interior Secretary Chapman . . . Otis Howard, manager of operations for Oklahoma G&E, takes over as director of NPA's Engine and Turbine Division, replacing C. F. Kells, who is leaving Oct. 31.

Latest from Midwest—Commonwealth Edison says there will be no great oversupply of power in Chicago area in the coming peak load season, but needs will be met . . . Iowa utilities are planning a transmission network that will obviate the need for government spending tax money in the state for power purposes . . . R. R. Katterhenry and W. A. Gentry have been elected assistant vice presidents of Indianapolis P&L.

Appliance customers are back in the market. Installment credit rose more in August than in any month since September, 1950. Big promotions by stores helped . . . Plans are being made for the largest lignite-burning power station in the U. S. Located south of Waco, Texas, it will have a 250,000-kw capacity.

Not 1 kw of hydro capacity was added in U. S. in August, FPC reports. But steam additions were a walloping 937,500 kw. Total capacity as of Sept. 1 was 73,635,546 kw, made up of hydro, 18,512,796; steam, 53,174,925; internal combustion, 1,947,744.

Skagit County PUD, Mount Vernon, Wash., agrees to a contingency contract with Guy C. Myers calling for 1% commission if he can arrange a purchase of some Puget Sound P&L properties . . . Appalachian EP will pay Raleigh Wyoming Mining Co $11,584 for system serving Edwight and $2,002 to Olga Coal for facilities at Buchanan, both in West Virginia.

Subject to SEC and Massachusetts Dept of Public Utilities, New England Electric System accepts offer of $22,780,000 from group of investors headed by Lehman Bros and Bear, Stearns & Co for its ten gas companies in Massachusetts . . . Of nearly $3 billion raised by American business in 1950 by private borrowing direct from insurance companies and other institutions, public utility companies received $986.7 million, according to annual survey of E. V. Hale & Co, Chicago . . . United Electric Coal Companies reports that electric utilities were biggest customer for year ended July 31, taking 37% as compared with 14% in 1943.

Rains in Northwest erase fears of power brownout, steam plants close, aluminum companies get back 245,000 kw of interruptible power.

Hawaiian Electric and IBEW agree on 14¢ hourly pay boost with minimum starting rate of $1.19 an hour.

U. S. Court of Appeals for Fourth Circuit upholds Virginia E&P's permit to build 91,000-kw Roanoke Rapids project . . . Alabama Electric Cooperative, Inc, plans to award contracts this month for new $3.2 million, 15,000-kw steam plant at Gantt.

Congratulations—Allis-Chalmers Manufacturing names R. M. Casper, manager of new power department . . . VP Adam S. Bennion, Utah P&L, heads citizens group appointed by Utah legislature to make survey of public school system . . . J. P. Jones becomes acting regional engineer of Reclamation Bureau's Region III replacing C. A. Bissell, resigned . . . Pres H. A. Cooch, Canadian Westinghouse, heads Canadian Electrical Manufacturers Association.

Obituary—Sam Vining, Westinghouse electrical division merchandising consultant, Sept. 29.

AERIAL PANORAMA looks south toward Buffalo. American project is to the left of the river, Canadian to the right

Who Will Redevelop the Niagara?

Congress Must Decide Whether It Will Be the Federal Government, New York State, or 5 Private Companies Headed by Niagara Mohawk

Testimony on Niagara redevelopment is all in; each of the parties is set to go ahead. All that remains is for Congress to decide which of the three—private enterprise, the federal government, or the State of New York—will build it.

The $400-million Niagara redevelopment will be built—that's certain. By 1960 the New York area will need twice the 1,132,000 kw of new dependable power it will produce. The engineering plans are firm—they will be along lines set down in 1949 by the Bureau of Power of the Federal Power Commission.

So the matter rests now with the Senate and House Public Works Committees, which last month completed hearings on the project. Rivalry for their favor is intense. They could recommend passage of one of three measures:

1. A bill to permit development by the federal government under supervision of the Army Engineers. The project would be turned over to the State of New York if the state met certain conditions. Until the conditions were fulfilled, the development would be operated by a federal agency, probably Interior (Lehman-Roosevelt).

2. A bill to permit the Power Authority of the State of New York to build and operate the project (Ives-Cole).

3. A bill to permit financing, construction, and operation by private enterprise; specifically, by Niagara Mohawk Power Corp and four other New York utilities (Capehart-Miller).

All three provide for maintenance and remedial work to safeguard the scenic beauty of the Niagara Falls and River.

The way for Niagara redevelopment was paved Feb. 27, 1950, by the signing of a new treaty with Canada concerning use of the waters of the Niagara River. Even before this, FPC, with the assistance of Niagara Mohawk and Power Authority engineers, had completed detailed plans for work on the U. S. side.

The basic treaty of 1909 permitted daily diversion for power purposes of 20,000 cfs by the United States and 36,000 cfs by Canada. This and water provided by later revisions proved inadequate for present power needs. Under the new treaty, the United States got an average of 45,000 cfs more a day. On our side power production would be increased from dependable capacity of 440,000 kw to 1,572,000 kw. Annual energy production in the U. S. would be increased from 3.7 billion to 11.6 billion kwhr.

. Canada got 29,000 cfs more than the 1909 allotment, making it possible for her to double existing capacity of 848,000 kw.

Present development on the American side is operated by Niagara Mohawk under a 50-year license extending to March 21, 1971. It consists of the 365,000-kw Schoellkopf Station 3,000 ft downstream from the American Falls and the 80,000-kw Adams Station 7,000 ft above. Water under a 215-ft head reaches the Schoellkopf Station through a 4,500-ft tunnel from the Niagara River at Port Day.

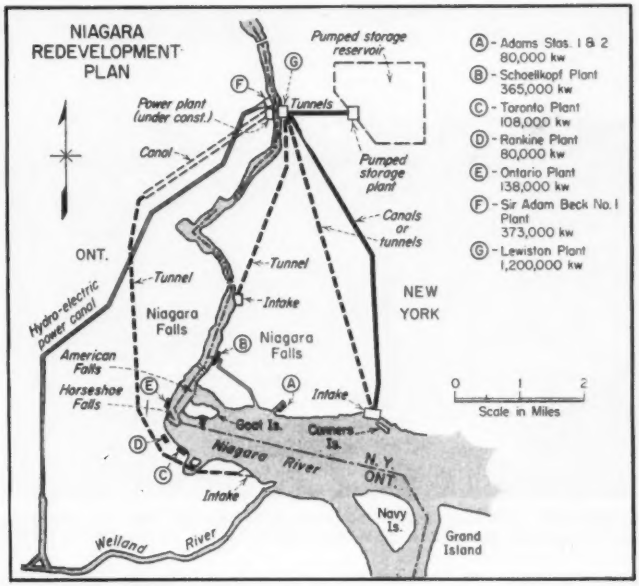
Would Operate as Condenser

The FPC plan calls for retention of Schoellkopf and retirement of Adams. Adams would continue in operation as a condenser on the Niagara Mohawk system, but would not use large amounts of water.

A large plant with total capacity of 1.2 million kw would be constructed at the foot of the Lower Rapids at Lewiston (See map and aerial panorama). It will consist of two sections, drawing water from different sources. The larger, Connors Island-Lewiston section, will generate 1,080,000 kw. Waterway tunnels or covered canals about four miles long would be constructed from a point above the falls opposite Conners Island to serve the section. The Lower Niagara River unit of the plant would produce 120,000 kw. To serve it, discharge from Schoellkopf would be recaptured from the river below the falls and directed into a tunnel to the plant.

Scenic Value Would Not Suffer

Under the treaty, more water may be diverted from the falls and river at night than during the day, so the scenic value of the area will not suffer during daylight hours. For this reason, a pumped storage reservoir would be built to the east of Lewiston Station to store some of the night flows so they could be used the next day when power demands were greatest. This would also give close control of the water near the generating plants. The pumps would be reversible so they could be used to drive generators at the reservoir during outflow periods, producing an additional 130,000 kw. Much of the energy used to pump water into the reservoir could be recaptured in this way.



AREA MAP SHOWS present, proposed hydro development in U. S. and Canada

In addition, an international investigation is planned to determine whether it would be possible to construct control works in the Niagara River near the outlet of Lake Erie. This could probably provide additional weekly or monthly storage.

In 1949 FPC estimated cost of the project at $309 to $350 million. Rising costs are expected to boost the figure to $400 million. Cost of energy at 1949 figures, the commission said, would be about 2.08 mills per kwhr for public development and 5.6 mills for private development. The government would be able to build and operate the plants at a low money rate and with no federal taxes. Private industry financing would include a higher money rate, return on common stock, federal taxes, and like expenditures.

While development on the American side hangs on Congressional action, Canada has already begun to develop her side of the river. The Hydro-Electric Power Commission of Ontario is constructing Sir Adam Beck Station No. 2 at the foot of the rapids roughly opposite the site of the proposed Lewiston Station. A tunnel is being dug underneath Niagara Falls, Ont., from above Horseshoe Falls to the plant, and a second is planned along the same route. The station will have three 100,000-kw units in operation by 1954 and another four by 1955.

The U. S. Senate and House have an understanding that no new controversial measures will be introduced this session. So the Niagara bill will undoubtedly hold over until next year. The Senate committee isn't expected to act on it before adjournment, but the House may act before that time.

Private power's plan was presented to both committees by Earle J. Machold, president of Niagara Mohawk Power Corp. He said his company and four others—New York State Electric & Gas Corp, Consolidated Edison Co of New York, Rochester Gas & Electric Corp, and Central Hudson Gas & Electric Corp—would band together to form a company that would finance and build the project.

Machold's group contends citizens in areas distant from the project should not be made to pay its construction costs, as would be the case if the federal government built it. It argues against federal and state construction on the grounds that in either case, no taxes would be paid on the project.

In the hearings, the Niagara Mohawk president said payments in lieu of taxes, such as are made by Tennessee Valley Authority, fall far short of

SCHOELLKOPF STATION, 365,000-kw plant below Niagara Falls on American side, is Niagara Mohawk Power Corp's largest single source of hydroelectric power

reimbursing state and local governments for property taxes lost. The Hoover Commission Task Force, he pointed out, analyzed typical residential and commercial electric bills in areas of both publicly owned and privately owned utilities. "In general," the Task Force reported, "this analysis shows that the differential between public power bills and those for privately owned power companies is roughly equal to the tax component."

In contrast, Machold said, the five private companies paid $136 million in taxes in 1950, $56 million in federal, and $80 million in state and local taxes.

"If our group of companies," Machold said, "were authorized to go ahead with the redevelopment of the available waters of the Niagara River, utilization of project power would be supervised by us jointly. We would, as we now do in our daily operations, operate our interconnected systems and distribute the available power in such manner as to realize its most economic potentialities to the end that maximum benefits would flow to as many consumers as possible."

He added that if an FPC license were issued to the five companies, they would not object to provisions for federal or state recapture of the Niagara redevelopment project becoming operative in 1971 when Niagara Mohawk's license for its existing Niagara development expires.

John E. Burton, chairman of the New York Power Authority, was skeptical of the part of the federal bill that said the project would be turned over to the state if an agreement could be reached between the two. He said he doubted that the agreement ever would come about, and that the project would become "a straight federal power project without even a pretense of constitutionality."

The state bills, he said, would "gain the objective of the greatest rate reduction for the most rural and domestic consumers in the Northeast."

Sen Herbert H. Lehman, who with Rep Franklin D. Roosevelt, Jr, Democrat, sponsored the federal development bill, said the project was a "bonanza" belonging to all the people of the country.

"The project should be developed," he said, "with special consideration for the needs of public utilities, such as state and municipal bodies, and for the needs of special groups, such rural cooperatives for whom special government consideration is merited in the public interest."

President Truman backed the federal development bill; Interior supported it as the only way to safeguard public interest. An Interior spokesman asked that his department be designated the agency to operate the project and market the power until the State of New York might take over these functions.

Both committees decided they'd have to have time to think—and talk—it over.

The Niagara has the largest remaining power potential in the East. How Congress decides the three-cornered battle for control of the development may well set a precedent that will point the way the private power-public power struggle is to go in years to come. That is why each party is willing to throw all it has into an effort to win Congress over.

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Truman Delays Naming Successor to Wallgren

President Truman has indicated he is in no special hurry to nominate a successor to Mon C. Wallgren, who resigned last week as chairman of the Federal Power Commission.

In resubmitting his resignation, first tendered last spring, the former governor of Washington said it was prompted by "personal and private" reasons.

The President accepted the resignation "with genuine regret," adding that it did not come as a surprise.

Wallgren was confirmed as FPC head after Truman withdrew his nomination for chairman of the National Security Resources Board in 1949. The Senate Armed Services Committee had refused to approve him for that post.

It is reported the 60-year-old jeweler and optometrist may reenter politics in Washington State or settle down in California.

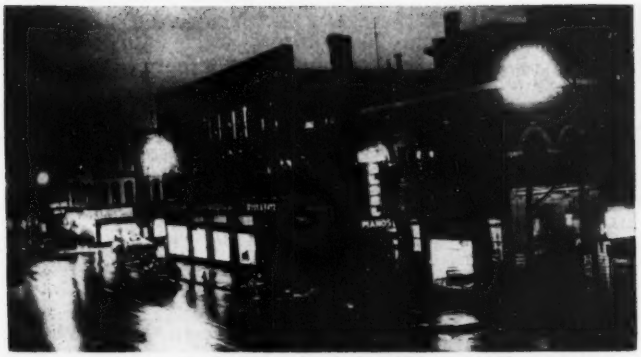
•

Court Temporarily Halts Arkansas Co-op's Plans

An Arkansas super-cooperative has been stopped, at least temporarily, from constructing a 30,000-kw steam plant and 544 miles of transmission line which private utilities say would duplicate existing facilities.

The halt was called by the Circuit Court of Pulaski County, which enjoined Arkansas Electric Cooperative Corporation from proceeding with construction until a permit issued by Arkansas Public Service Commission has been reviewed by the court.

Four private utilities and the International Brotherhood of Electrical Workers, AFL, had appealed the PSC order.



MIDNIGHT IN SOUTH BEND? No—10 A. M. Freak cloud formation blanketed city one morning recently, developing unexpected load for Indiana & Michigan Electric Co

Legislation Authorizing BPA to Build Fuel-Fired Plants Opposed at Hearing

Legislation which would authorize Bonneville Power Administration to build a number of fuel-fired electric generating plants ran into opposition at its first hearing last week.

Two Arkansas Congressmen charged the Interior Department is seeking to build up its power empire in the Pacific Northwest at the expense of industrial expansion in other parts of the country.

J. Frank Ward, president of the American Public Power Association, said the proposed steam plants should take a place behind other more vital measures for increasing electric power capacity in the area. He said all federal hydroelectric projects should come first, nonfederal hydro projects second, and finally the steam plants.

Ward, whose statement was read by Alex Radin, manager of the association, also attacked the section of the legislation which would permit the Interior Department to fix rates without approval of the Federal Power Commission. "This provision is not in keeping with the long established policy of checks and balances in government operation," he said.

The bill, introduced by Rep Henry M. Jackson, Democrat, Wash., would authorize BPA to construct three 100,000-kw steam plants and five smaller plants using gas turbines.

Frank M. Wilkes, president of Southwestern Gas & Electric Co., told the House Public Works Committee he hoped the legislation would not become a precedent for further federal construction of steam plants throughout the nation.

Strongest proponent of the measure was Interior Secretary Oscar L. Chapman, who said the construction of the auxiliary plants is one of the "necessary steps" which the welfare of the country demands to be taken to correct the Northwest's power deficiency.

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Seattle City Light Load Is Outstripping Capacity

Predicting that Seattle City Light never again will own sufficient generation to carry its own load, E. R. Hoffman, City Light superintendent, said "the tremendous and continued growth in population" has caused a rapid increase in electric power load."

In a report to the city council on the critical power situation in the Pacific Northwest, he declared that despite additions to plant capacity "it is apparent that the power load has outgrown all Skagit (River) possibilities." No other low cost power sites are available.

The $100-million expansion program of the municipal system and contracts with Bonneville Power Administration and Puget Sound Power & Light Co will enable the municipal system to meet all present needs of its customers, Hoffman pointed out. He added that consumer usage would be curtailed, nevertheless, if Defense Power Administration ordered it.

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Truman Hopes to Revive Passamaquoddy Project

There still is hope among government officials that the Passamaquoddy Project, off the coast of Maine, will be revived.

At a recent press conference, President Truman said he hasn't as yet given up on the project, which would be designed to generate electric power from tidewaters of the Bay of Fundy.

The Army Corps of Engineers, which spent $700,000 on preliminary studies of the project during 1935-36, also has new hope. Surveys made by the U. S. Geological Survey this past summer indicate suitable foundations can be found for locating some of the major project structures. This was in contrast to discouraging findings made earlier—by the Engineers.

But the Geological Survey data has not yet been fully evaluated. This may take two months or longer. Until then, the Engineers won't be ready to submit a new report on Passamaquoddy—long called the Army's "ugly duckling."

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Work on Hungry Horse Dam Ahead of Schedule

Construction is ahead of schedule on the Bureau of Reclamation's Hungry Horse project, which is slated to furnish power for the Harvey Machine Co's proposed aluminum plant.

The bureau reported last week it expected the first two 71,250-kv generators to be ready for testing several months ahead of their scheduled in-service dates late next year.

•

Record Coal Transaction

Tennessee Valley Authority has completed what it believes to be the largest single purchase of coal in the nation's history. The agency approved contracts for delivery of 18,043,750 tons over periods of from one to ten years at a total cost of $63,331,875.

Wage Increases Approved by Seattle City Council

City employees at Seattle, Wash., including those of City Light, were granted wage increases averaging $25 a month in the 1952 budget just approved by the city council. Part of the additional revenue will be obtained by increasing the utilities tax on City Light gross income from 3% to 4%.

Employees in the clerical services, including stenographers, clerk-stenographers, clerks, secretaries, and laborers will receive increases of $20 a month. Increases for accountants, engineers, and subordinate officials vary from $25 to $60 a month.

City Light's electrical employees, represented by the Electrical Workers Union, fare especially well in both wage and working condition concessions.

Linemen's pay has been raised from $18 a day to $19.60, an advance of about $35 a month. The compensation of those in higher classifications was upped proportionately.

E. R. Hoffman, City Light superintendent, was granted an increase from $12,500 to $15,000 a year.

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Northwest PUD to Supply Power for 'Voice' Station

The Grays Harbor PUD of Aberdeen, Wash., has been asked by the Department of State to supply 7,500 kw of power for a $5 million Voice of America radio station to be constructed near that city.

The station will be one of the world's two largest and most powerful, according to Republican Rep Russell V. Mack of nearby Hoquiam. A sister station will be constructed in North Carolina.

•

New Unit to Be Added

Hydro Electric Power Commission of Ontario has decided to construct a seventh unit at the new Sir Adam Beck Plant now under construction at Queenston, Ont. The unit will be 100,000 hp.

•

Line Crew Saves a Life

An injured motorist owes his life to the keen eyes and quick action of a Pacific Power & Light Co line crew. Looking down from his vantage point atop the pole on which he was working, a PP&L line man spotted an auto wreck near Dayton, Ore. He and his crew rushed over and pulled the injured man from the wreckage. The crew foreman applied artificial respiration immediately and ten minutes later the crash victim resumed normal respiration.

•

Washington University Conducts Static Tests

A duplicate of one of the largest Bonneville Power Administration cables has been erected in a wind tunnel at the University of Washington, Seattle, to learn how much radio static is caused by wind-whipped power lines.

While propellers of wind machines operate at full speed, laboratory tests are being made of effects of high-voltage currents equivalent to those that will be carried by a 287-kv Grand Coulee-Olympia line. Highest voltage now carried by any power line in Pacific Northwest is 230 kv. Wind and smoke conditions have a tendency to add to static.

Results of tests are recorded on testing machines operating on frequencies used by radio stations. Upon completion of experiments at the university experiment station, BPA plans subsequent field checks.

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Paper Not AFL-Endorsed

William Green, president of the American Federation of Labor, has told member unions that a publication, "Trade Union Courier," has been representing itself as an organ approved by the AFL. The publication, he said in a letter, has been soliciting funds from industries on the basis that it had full endorsement of the labor organization. No endorsement of this kind, he said, has been given by the AFL.

•

Approves Ten-Year Pact

The Radford, Va., city council has approved a ten-year agreement with the Appalachian Electric Power Co for the purchase of electricity and power. The contract became effective Oct. 1.

Where Utilities Can Get Information about Material Allotments and Construction

To obtain information promptly about material allotments or construction authorizations for major plant additions, Defense Electric Power Administration suggests that utilities contact the appropriate section chiefs or their assistants.

All offices are located in the Interior Department Building, 18th and C Streets, NW, Washington. Phone extensions are on REpublic 1820. On personal calls visitors should enter Room 5218 where a receptionist will arrange the necessary interviews.

Key sections, personnel, and their assignments follow:

Generation Section, for projects involving a plant—A. A. Boettcher, chief, Extension 5216; Gardner C. George and Stanley Moyer, assistants.

Transmission Section, for projects involving lines above 35 kv and substations having a high-side voltage above 35 kv—M. E. Sutton, chief, Extension 5385; L. E. Frey and Sedric Payette, assistants.

Distribution Section, for projects involving lines operating at or below 35 kv and substations having a high-side voltage of 35 kv or below—C. E. Hartay, chief, Extension 5385; A. M. Frost and E. Eugene Howe, assistants.

A project which includes lines or substations above 35 kv in addition to lines or substations below 35 kv is handled by the Transmission Section.

These sections are under the Major Projects Control Branch of which C. T. Hurd is chief and E. W. Cornforth is assistant chief, both on Extension 5216. Interpretations of policy or information on other matters of general nature should be obtained from them.

Wilson Report Confirms Power Expansion Cutback

The electric power expansion is being set back because of reduced material allotments. This isn't news to the industry. But it is part of Defense Mobilizer Charles E. Wilson's third quarterly report to the President. He expects the industry to meet this year's goal of approximately 7 million kw (There was a net increase of 5,134,700 kw in the first eight months of the year.), but after that the going will be slower.

In his report Wilson made these observations on the electric power program:

"The electric industry so far this year has put in place generating capacity and distribution systems valued at $2 billion, including both private and public projects. The industry has plans for an investment of another $1 billion in new plant this year and $8 billion more in the next two years. This will be delayed, however, by the reduced allocations of CMP materials.

"In the first half of 1951 the industry added new generating capacity of 3.5 million kw; in the second half an addition of a little more than that was planned. Even with the cutback in its CMP allocations the targets for this year will be approximated. This will mean an increase in the country's generating capacity of about 10% over 1950 capacity, a record increase for one year."

•

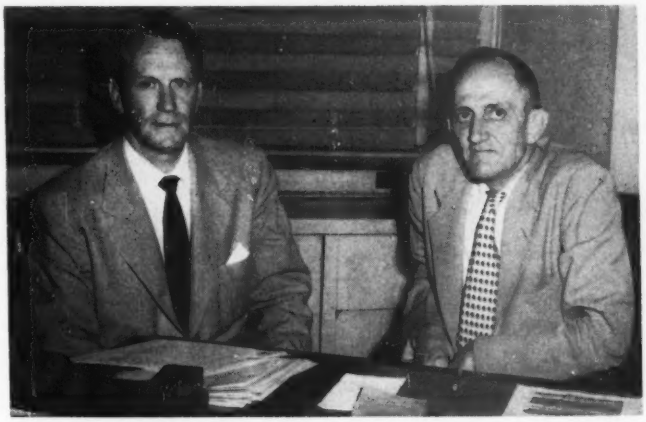
4th Q Copper Allocation Aids U. S. Industry Little

U. S. industry will get little more copper than it has in recent months under the international allocation of red metal for the fourth quarter. Imports now are 30% under 1950 levels.

U. S. members of the International Materials Conference, which worked out the allocation, hope we will get more. This country is down for 364,611 short tons from domestic and foreign sources. This would indicate an increase of 20,000 tons over what we have been importing so far this year.

But there is a flaw in the agreement: No international price ceilings were set. This means consumers abroad can continue to pay 50¢ or more a lb, compared with 27½¢ a lb U. S. consumers are allowed to pay under our price ceilings.

The allocators didn't nail down all the Chilean production, as they had hoped to. Chile put 80% of the copper from its big mines into the plan. But it will sell the rest of its output where it likes, even if this puts the purchasing country over the allocation.



JOHN D. DAVIS, left, Washington director of Bonneville Power Administration, has become deputy director of Defense Electric Power Administration. His predecessor, Ken G. Whitaker, is back with Electric Power Board of Chattanooga

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Lead Shortage Acute

The shortage of lead has become so acute that it should be made a CMP material, makers of bearings have told the NPA.

ARTHUR B. VIEREGG has left Budget Bureau to be chief of DEPA's Power Coordination and Planning Branch

Agencies Will Appeal 1st Q 1952 Allotments

Claimant agencies for electric utilities and equipment manufacturers took one look last week at the preliminary materials allotment figures for the first quarter of 1952. Then they started preparing their appeals to higher authority.

The figures are confidential, but the picture for the agencies looked something like this:

Depa—Got more than in fourth quarter '51, but still below requirements. Structural steel is the bottleneck, but more aluminum and copper also are needed if shipping schedules are to be maintained.

NPA's Electrical Equipment Division—Got less than the original fourth quarter '51 allotment. For some controlled metals the preliminary figure is 15 to 20% under. Copper will probably be the bottleneck for the manufacturers.

NPA's Engine and Turbine Division—Got practically all materials requested, but requests were said to be the minimum with which schedules could be maintained. Stainless steel for heat exchangers was given the biggest slash.

To add to the industry's troubles NPA has set Oct. 7 as the cutoff date for shipping third quarter materials. This means that a fourth quarter allotment must be secured for equipment if the shipping date was delayed beyond Oct. 7.

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds 1st	Bonds 2nd	Bonds 3rd	Preferred Stocks 1st	Preferred Stocks 2nd	Preferred Stocks 3rd	Common Stocks 1st	Common Stocks 2nd	Common Stocks 3rd
DATE									
1951									
Sept. 27	**2.87**	**2.91**	**3.04**	**4.05**	**4.27**	**4.61**	**5.52**	**6.24**	**7.05**
Sept. 20	2.85	2.89	3.05	4.05	4.26	4.60	5.51	6.19	7.00
END OF QTR.									
3rd 1951	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
2nd 1951	3.02	3.11	3.23	4.11	4.37	4.68	5.73	6.38	7.78
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13
4th 1950	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44

Data: Reis & Chandler, Inc.

Utility Seeks Extension of Surcharge; 2 Cut Rates

Kansas Power & Light Co recently asked the State Corporation Commission for permission to extend a 10% surcharge—already in effect—for a period of three years.

Since the temporary surcharge was granted in 1949, the company has merged the properties of Kansas Electric Power Co and the city of Lawrence into its system. The new application, if granted, would mean a 10% boost in rates for customers served by the Lawrence Plant. No increases are being sought above the 1949 level for customers of the remaining part of the system.

In other rate matters, New York's Public Service Commission extended the present interim gas and electric rates of Long Island Lighting Co from Sept. 30, 1951, to March 31, 1952. Between February, 1948, and January, 1951, the company's electric rates were reduced by about $2,207,000 annually and gas rates were increased $3 million annually, both on an interim basis. The PSC is continuing its review of the utility's rates.

In Canada, Sarnia, Ont., has put an 8 to 12% rate boost into effect. Commercial consumers will pay 10.7% more for their electricity, commercial consumers 12.1%, and power purchasers 8%.

In the face of increasing demands by utilities for higher rates, two companies have announced lower rates. Consumers Power Co, Jackson, Mich., has reduced rates for 22,000 customers in 16 counties a total of $200,000. The decrease is the second installment of a rate reduction made by Consumers when it took over customers served by the Michigan Public Service Co in 1950. Montana-Dakota Utilities Co also cut rates for customers in 60 North Dakota communities. The reductions will range from 75¢ to $1 a month.

The Georgia Public Service Commission has recessed the Georgia Power Co rate increase case in order to hear an expert witness to be presented by opponents of the hike. A new date has not been set for resuming the hearing. The witness is Dr Lionell Thatcher of the University of Maryland, an authority on utility rates of return and cost of money. The delay in the hearing was vigorously protested by Georgia Power, but to no avail.

FINANCIAL BRIEFS

Consumers Public Service Co (Brookfield, Mo.) plans to sell 1,500 shares of $50 par cumulative preferred stock . . . **Lansing, Mich., citizens** will vote on Nov. 6 on proposal to sell $6 million of bonds for the expansion of the municipal electric power system . . . **White Cloud, Mich. voters** have approved a proposal to sell the municipal electric power plant to Consumers Power Co for $135,000.

Twenty manufacturing firms have asked PUC to order the Pennsylvania Power & Light Co to pay them refunds totaling $1.3 million because PP&L's "coal clause" rate increase of Feb. 10, 1948, has been ruled illegal by the PUC . . . **General Public Utilities Corp** has increased the quarterly dividend on the common from 30c to 35c, payable Nov. 15 to stock of record Oct. 15. . . . **Michigan Public Service Commission** has reorganized into four divisions—administration, public utilities, transportation, and accounts.

Electric Utility Financing

Company	Description	Amount of Offering (000)	Offering Price	Yield at Price to Public
	WEEK OF SEPTEMBER 28—OCTOBER 3			
Bonds				
Public Service of Colorado	1st mtg, 3¼%, 1981 new money	$15,000	101.931%	3.15%
Idaho Power	1st mtg, 3¼%, 1981 new money	15,000	101.50	3.16
Preferred Stock				
*Toledo Edison	50,000 sh, 4.56%, new money	5,000	100.00 %	4.56%
Common Stock				
Pennsylvania Power & Light	542,484 sh (1-for-7, record Sept. 18, rights expire Oct. 3)	13,020	$24.00	6.67
	WEEK OF OCTOBER 4-11			
Bonds				
Arkansas Power & Light	1st mtg, 1981	$8,000	.....	.....
Pennsylvania Electric	1st mtg	5,000	.....	.....
Preferred Stock				
Pennsylvania Electric	30,000 sh	3,000	.....	.....
	SCHEDULED OCTOBER-NOVEMBER			
Bonds			Bid Date	
Nashville, Tenn.	electric revenues, 1954-1981	$3,500	Oct. 16	.....
New England Gas & Electric Association	coll tr, 1971	6,115	Oct. 16	.....
Wisconsin-Michigan Power	1st mtg	3,500	Oct. 22	.....
Rockland Light & Power	1st mtg	6,000	Oct. 24	.....
Utah Power & Light	1st mtg	9,000	Oct. 29	.....
Ohio Power	1st mtg	15,000	Oct. 30	.....
Ohio Power	serial notes	7,000	Oct. 30	.....
West Texas Utilities	1st mtg	8,000	Oct. 30	.....
Gulf States Utilities	1st mtg	10,000	Nov. 20	.....
Preferred Stock				
Public Service Electric & Gas	249,942 sh	24,994	Oct. 16*	.....
Pacific Gas & Electric	1.5 million sh, 1st preferred, $25 par	$37,500	Oct. 22	.....
Common Stock				
Central & South West	500,000 sh	.....	Oct. 16	.....
Public Service of Indiana	325,000 sh (1-for-10, record Oct. 8)	.....	Oct. 24**	.....
Consumers Power	561,517 sh (1-for-10, record Oct. 17)	.....	Nov. 2**	.....
	UNSCHEDULED—UNDER CONSIDERATION			
Bonds				
Virginia Electric & Power	1st mtg	$20,000	.....	.....

* Negotiated Sale
** Expiration Date

Interior Lets $17-Million Contract for Alaskan Unit

The Department of Interior has let a $17⅓ million contract for construction of a four-mile long transmountain water diversion tunnel and other facilities at Eklutna Project in the south central part of Alaska.

The project, which will have a generating capacity of 30,000 kw, will cost an estimated $34 million. The power is to be used in the Anchorage area. The project is also to provide many other water resource conservation benefits.

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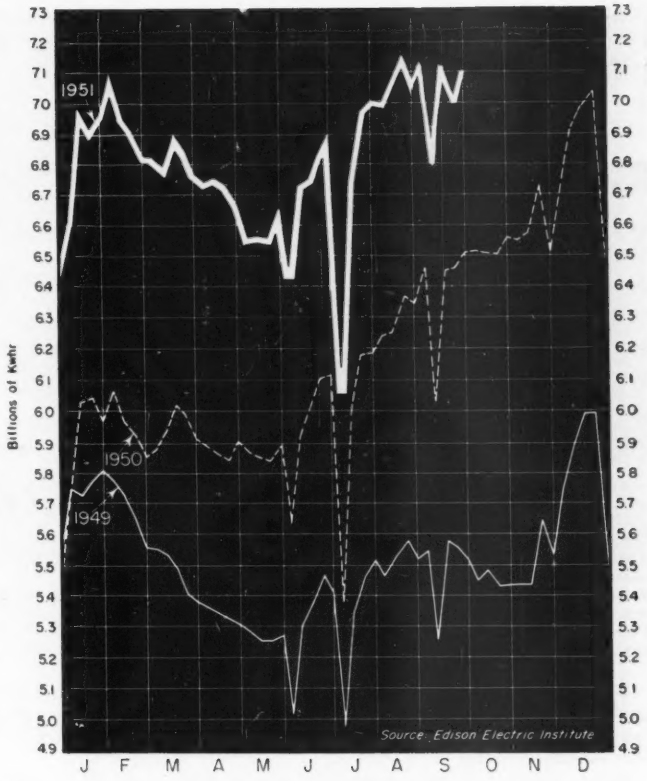
December Peak Rising

Electric utilities are raising their estimates of December peaks for the coming years. Here is the difference between the estimate of last January and that of last July:

December	January Estimate (Kw)	July Estimate (Kw)
1951	68,705,000	69,526,000
1952	74,705,000	76,317,000
1953	80,222,000	82,714,000
1954	85,094,000	87,945,000



Output Week Ended Sept. 29—7,101,794,000 Kwhr

Weekly Output, Millions Kwhr			Per Cent Change from Previous Year			
1951	1950	1949		Sept 29	Sept 22	Sept 15
Sept 29 7,102	Sept 30 6,503	Oct 1 5,521	New England	+ 1.6	+ 3.0	+ 4.1
Sept 22 7,014	Sept 23 6,457	Sept 24 5,556	Mid-Atlantic	+ 6.7	+ 8.9	+ 8.9
Sept 15 7,138	Sept 16 6,449	Sept 17 5,579	Central Industrial	+ 5.7	+ 5.3	+ 6.9
Sept 8 6,795	Sept 9 6,029	Sept 10 5,258	West Central	+11.6	+ 8.5	+12.8
Sept 1 7,146	Sept 2 6,459	Sept 3 5,544	Southeast	+13.2	+11.6	+12.8
Aug 25 7,077	Aug 26 6,346	Aug 27 5,523	South Central	+24.4	+12.9	+29.3
Aug 18 7,164	Aug 17 6,370	Aug 16 5,579	Rocky Mountain	+11.2	+ 8.3	+ 3.6
Aug 11 7,070	Aug 12 6,253	Aug 13 5,530	Pacific Coast	+ 8.1	+10.5	+11.8
Aug 4 7,003	Aug 5 6,247	Aug 6 5,466				
July 28 7,005	July 29 6,190	July 30 5,518	Total United States	+ 9.2	+ 8.6	+10.7

MEETINGS

Rural Electrification Administration
Generating-Transmission Cooperatives Conference, Agriculture Department Bldg., Washington, D. C., October 8-12.

National Electrical Contractors Association
Annual Convention, Shoreham Hotel, Washington, D. C., October 8-12.

National Farm Electrification Conference
Annual Meeting, Hotel Gibson, Cincinnati, Ohio, October 9-10.

Indiana Electric Association
Annual Convention, French Lick Springs Hotel, French Lick, Ind., October 9-10.

Edison Electric Institute
Transmission-Distribution Committee, Sheraton Hotel, Rochester, N. Y., October 10-11.

International Association of Electrical Leagues
Annual Conference, Roosevelt Hotel, New Orleans, La., October 10-13.

Pennsylvania Electric Association
Transmission-Distribution Committee, Hotel Concord, Northeast, Pa., October 11-12; Hydraulic Power Committee, from Temple Club, Dallas, Pa., October 11-12; Joint Relay-Communications Committee, Emerson Hotel, Baltimore, Md., October 18-19; Electrical Equipment Committee, Penn Alto Hotel, Altoona, Pa., October 22-23; Meter Committee, Arlington Hotel, Oil City, Pa., October 25-26; Prime Movers Committee, Fort Stanwix Hotel, Johnstown, Pa., November 1-2; Systems Operation Committee, Split Rock Lodge, Split Rock, Pa., November 8-9.

Association of Edison Illuminating Companies
Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., October 11-13.

Southeastern Electric Exchange
Accounting Conference, Sir Walter Hotel, Raleigh, N. C., October 12-13; Sales Conference, Roosevelt Hotel, New Orleans, La., October 31, November 1-2.

International Association of Electrical Inspectors
Southern Section, Hotel John Marshall, Richmond, Va., October 15-17.

National Association of Railroad and Utilities Commissioners
Annual Convention, Francis Marion Hotel, Charleston, S. C., October 16-19.

Public Utilities Advertising Association
Hotel Cleveland, Cleveland, Ohio, October 18-19.

National Association of Corrosion Engineers
South Central Region Meeting, Robert Driscoll Hotel, Corpus Christi, Tex., October 18-20.

National Electronics Conference
Annual Conference, Edgewater Beach Hotel, Chicago, Ill., October 22-24.

American Standards Association
Annual Meeting, Waldorf-Astoria, New York, October 22-24.

University of Texas
Power Distribution Conference, Lower Colorado River Authority Auditorium, Austin, Tex., October 22-24.

American Institute of Electrical Engineers
Fall General Meeting, Hotel Cleveland, Cleveland, Ohio, October 22-26.

Electrical Inspectors' Association of British Columbia
Annual Conference, Hotel Georgia, Vancouver, B. C., November 2-3.

Northwest Public Power Association
Accounting Section, Governor Hotel, Olympia, Wash., November 8-9.

National Electrical Manufacturers Association
Chalfonte-Haddon Hall, Atlantic City, N. J. November 12-15.

Wisconsin Utilities Association
Electric-Gas Sections, Sales-Engineering Divisions, Schroeder Hotel, Milwaukee, Wis., November 14-16.

New Jersey Utilities Association
Annual Meeting, Seaview Country Club, Absecon, N. J., November 15-17.

American Society of Mechanical Engineers
Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., November 25-30.

Pacific Coast Electrical Association
Annual Hawaiian Conference, Royal Hawaiian Hotel, Honolulu, T. H., November 29-30.

WASHINGTON COMMENT

JESSE MOCK

SCRAPPY, the plastic-cloth leader of the scrap drive being conducted by the Business Paper Advisory Committee of the Advertising Council, meets other campaign leaders at Washington. Left to right are Robert D. Mossman, manager of advertising, Jones & Laughlin Steel Corp, volunteer coordinator of the council's campaign; Defense Mobilizer Charles E. Wilson; Scrappy; Manly Fleischmann, NPA administrator; and T. B. Repplier, president of the Advertising Council. Nelson Bond, a McGraw-Hill Publishing Co vice president, has been named chairman of the business paper committee

National Production Authority is bearing down on its steel scrap collection campaign. Goal for this year is to add 6.5 million tons to the 30 million tons of steel scrap that normally flow back to the mills.

Electric utilities have been in on the scrap drive since the beginning, but now the government is asking them to take a "second look" to see if more scrap can be secured.

Edison Electric Institute is heading up the drive among the utilities, but Defense Electric Power Administration is also pitching in. It has urged all utilities, which have not done so, to name a top executive to head individual campaigns.

The idea is to get someone with authority to say what is scrap and what is not. Men in lesser positions are understandably reluctant to make such decisions.

Main search is for "dormant" scrap, obsolete machinery and equipment. Production scrap, that portion left over from making products out of steel, is being pretty well taken care of.

Second step is to form a scrap committee and begin a thoroughgoing inspection of plants and other properties. From stories now coming into NPA's Salvage Division such searches can be interesting.

For instance, Gimbel Bros' department store in Philadelphia turned up 450 tons of scrap during a drive last month. TVA has set up a goal of 1,200 tons of steel scrap to be collected by the end of the year.

Until now, the Salvage Division has carried little material in its weekly newsletter on participation by electric utilities.

Depa's participation has a real purpose behind it. Any additional scrap collected should help break the bottleneck of structural steel allotments. If the electrical utilities could dig up enough scrap, they would be giving a tug to their own bootstraps.

Thus far this year, the steel mills have been fighting a losing battle for scrap. During the summer, when scrap inventories should have been building up, they were actually declining. In May steel companies tapped their inventories for 90,000 tons. And in June, despite the collection drive, the decline in inventories was 44,000 tons.

A survey in July showed scrap steel inventories 66% under the safety mark—about 20 days supply instead of the needed 60 days supply.

While the emphasis now is on collection of steel scrap, copper and aluminum scrap is just as scarce. The Salvage Division is now mapping out campaigns for collection of nonferrous scrap. These campaigns are expected to get underway in the next few months. Electric utilities, now suffering from materials shortages, should be among the most enthusiastic campaigners.

TECHNICAL NOTES

ARCHER E KNOWLTON

Angle-iron is good to use for paint-sample testing; if it has short life at the edges it can be presumed to have inferior durability.

Tower legs are primed one year and finish-coated the next by one company; the bond is better but the priming coat has to be durable in its own right.

Loss-of-excitation protection is desirable if there is likelihood of failure of the exciter-drive coupling.

Multiconductor control cables in trays offer opportunity to escape the cost of conduit runs.

Reheat installations of recent vintage are reported capable of operation at partial load for longer periods than were feasible with predecessor units.

Welding beads not removed from high pressure piping have been responsible for shot-peening of turbine blading.

Centralized control is tending to require that more and more instruments be readable from sitting position at the control desk; the less important ones could be relegated.

Flyash sampling for possible use in cement can be done by running across the duct a slitted pipe with a wood auger inside for extraction.

Sapwood of Southern yellow pine is thick, has high fiber strength, and can be treated to full depth; the heartwood is also reasonably durable.

Ventilation of power plants for comfortable operation may check the trend toward elimination of windows unless a good alternative is developed.

GOOD LIGHTING in dairy barn of Wisconsin Utilities Assn research farm increases efficiency of operator in cleaning stalls. Other electrical equipment in barn includes cow trainers, clippers, insecticide sprayer, and dehorning unit

Full-Use Farm Load Will Improve Shape of System Curve

Potentiality of farm electrification in benefit to users and as a market for equipment and service is indicated by data from research farm

PETER F. DENS, Student, F. W. DUFFEE, Professor, HAROLD A. PETERSON, Chairman, Electrical Engineering Department, University of Wisconsin, F. D. MACKIE, Superintendent of Distribution, Madison Gas & Electric Co

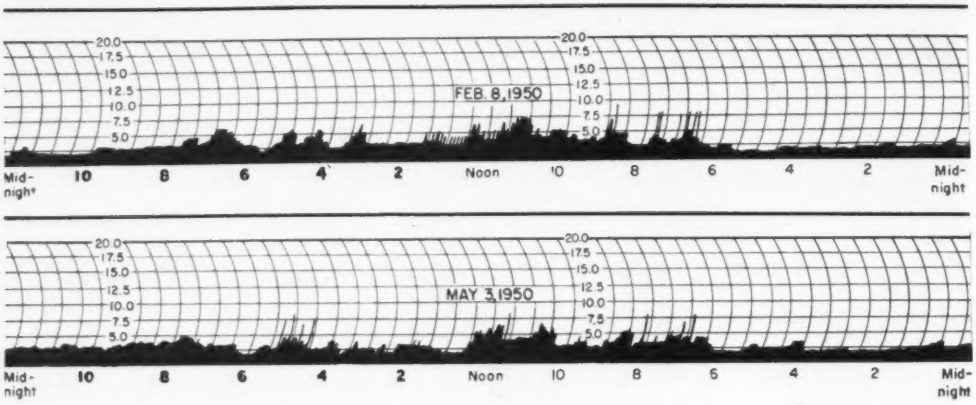
When farmers are making full use of electricity in all ways of benefit to them, load curves of systems supplying the farm load will be improved. This is indicated by studies made at the research farm of the Wisconsin Utilities Association. Studies indicate a significant diversity between full-use farm load and the entire system load.

The research farm is a dairy operation (24 milking cows) of average size (144 acres), representative of southern Wisconsin. Its purpose is to demonstrate the practicability of electric applications by actual use in ordinary farm conditions.

Load Characteristics . . . The accompanying four typical daily load charts for winter, spring, summer, and fall operations show a consistent characteristic, a drop in the farm load just ahead of the usual system evening peak. For systems with morning peaks, the indicated effect of the farm load is not so good. But even here there is apparent benefit due to the persistence of the farm load at high level through the noon hour. These and other records show what may be expected in future growth of the dairy farm load and what utility engineers should design and plan to serve it.

Monthly energy consumption shows how usage has increased as more electricity applications have been made in the farm home and on the farmstead. Also listed are appliances and equipment in use and their connected loads.

Seasonal Use . . . Energy consumptions for the first five months of 1949, 1950, and 1951 were very nearly the same but were 61% over those for 1948. Of the total consumption, one-



DAILY CHARTS of research farm load show daytime peaks and low spots at time of usual system evening peaks. These charts

Total Energy Consumption by Months Kilowatt Hours

	1948	1949	1950	1951
January	1,834	3,488	3,678*	3,270
February	2,866	3,484	3,928*	3,750
March	3,066	3,572	4,506*	4,000
April	2,510	3,452	4,134*	3,140
May	1,896	3,200	3,468*	2,820
June	2,384	3,874	2,780	2,470
July	4,198	4,888	5,568	.....
August	2,466	4,016	2,562	.....
September	1,852	2,408	4,578	.....
October	1,980	2,650	2,612	.....
November	2,536	3,618	2,930	.....
December	3,296	4,378	4,060	.....
Annual Total	30,884	43,028	44,804	.....

* Special equipment caused abnormal use of 500 to 1,000 kwhr per month during these months

third was for heating water. Submeters were used on the water heaters from March 11, 1950 to May 24, 1950. During this time the large water heater in the house used 1,939 kwhr and the small, milk house, water heater used 1,352 kwhr.

Consumption figures show that usage is almost constant during the first five months. Consumption increased during the haying season, due to operation of the hay drier. Actual haying season varied with weather from year to year. October was a month of low use. As the shorter days and colder weather approached the consumption increased steadily.

Several farms having large electrical loads in the vicinity of the research farm were visited and checks of equipment in use were made. At one farm with essentially the same equipment, usage averaged 3,600 kwhr per month during the first four months of 1950, compared with an average of 4,062 kwhr for the research farm. Another farm, having the same equipment except in the house, averaged about 1,700 kwhr per month. These were large dairy farms with 40 to 60 milking cows.

Average Farm Customer . . . Energy consumption of the average farm customer in Wisconsin during March, 1950 was 288 kwhr. This, compared to the research farm consumption of 4,506 kwhr, indicates the large sales field the rural areas offer for electrical equipment.

From data obtained for the first five months of 1949, 1950, and 1951, a utility company constructing new lines to serve rural customers or rebuilding existing lines should allow for a usage of at least 2,000 kwhr per month per dairy farm customer. Although this is less than 50% of the usage of the research farm, it is 100% above the average of the most progressive farms being served now, and 12 times the average of the pres-

Electrified Farm Equipment

Motor-driven

Application	Number	Horse-Power
Corn grinder	1	7 1/2
Hammer mill	1	2
Farm elevator	1	2
Corn elevator	1	3/4
Metering augers	4	1/4
Concentrate feeder	1	1/6
Bran agitator	1	1/6
Portable feed hopper	1	1
Silo unloader	1	3
Barn cleaner	4	1 1/2
Milking machine	1	1
Ventilating fan	1	1/2
Milk cooler	1	3/4
Water pump	1	1/2
Saw and jointer	1	3/4
Drill press	1	1/4

Heating

Application	Number	Wattage
Milk house space heater	1	3,000
Milk house water heater	1	1,000
Chick brooder, heat lamps	3	250
Water warmer, immersion	2	.....
Hog brooder, heating cable	1-60 ft	400

Lighting and Miscellaneous

Lights for night feeding of hogs, for poultry house, and for buildings and yard; 6,000-w arc welder; electric cow trainers, fences, clippers, fly sprayer and dehorning unit; radio; intercommunication system

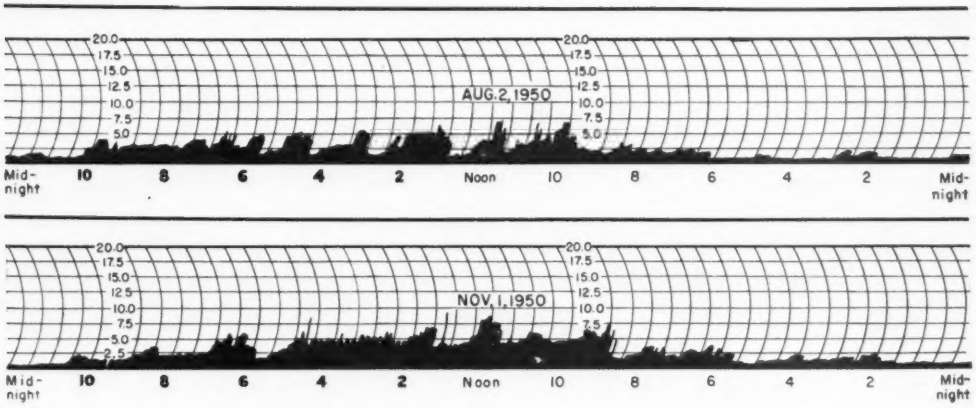
Electrified Farmstead Appliances

	Wattage
Range (utility)	10,700
Range (kitchen)	17,540
Water heater	4,000
Food freezer	725
Clothes dryer	4,700
Automatic washer	575
Refrigerator	287
Ironer	1,620
Roaster	1,200
Dishwasher	1,000
Space heater	1,300

Other appliances include iron, pasteurizer (1 gal. size), toaster, three radios, mixer, heating pad, coffee maker, hot plate (2-unit), vacuum cleaner, knife sharpener and inter-communication system. Approximate total of lighting and appliances in the farm house is 45 kw.

Summary of Connected Farm Load

	Kw
House	44.65
Barn	16.8
Feed processing unit	18.99
Shop	9.35
Milk house	3.58
Hog and poultry house	2.1
Miscellaneous	1.8
Total	96.57



show load on a typical Wednesday for all four seasons of the year. Multiply curves on charts by 2 to get the actual power demand

ent rural consumption. This should provide adequate distribution to handle the rural load for the next several years.

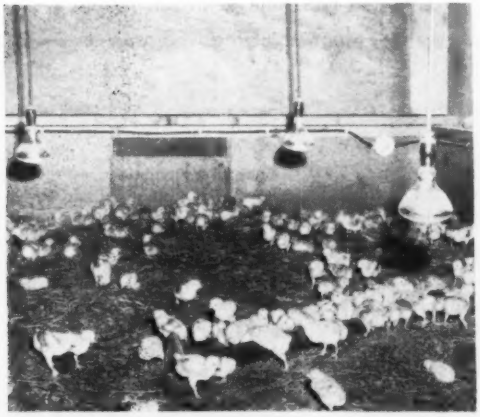
Interpreting Results . . . To aid in interpreting charts, periods of operation of the barn cleaner, silo unloader, feed grinder, 7½ hp-motor and welder were recorded. From these records it was possible to determine the components of peak loads and account for them. Daily readings of the watthour meters also were taken.

During winter months the load is quite constant from 7:00 am until 7:00 or 8:00 pm. There are a few peaks resulting from the use of larger motors. The first peak usually occurs at about 7:30 am, when the 3-hp silo unloader is operated simultaneously with the milking machine and milk cooler. The second peak usually occurs at 10:00 am when the barn cleaner is operated. A peak occurs in the early afternoon because of grinding feed. From 5:00 to 6:30 pm, a lesser peak occurs when the silo unloader, milking machine, and milk cooler are again in use. Throughout the day, some high loads result from operating the electric clothes drier in addition to other equipment.

During cold weather, the 1,000-w water heater element is on about 23 hours a day due to the slow recovery time and because some of the hot water was circulated through a small radiator and used together with the milk cooler, for heating the milk house. Highest sustained load for a period of 15 min was 24 kw.

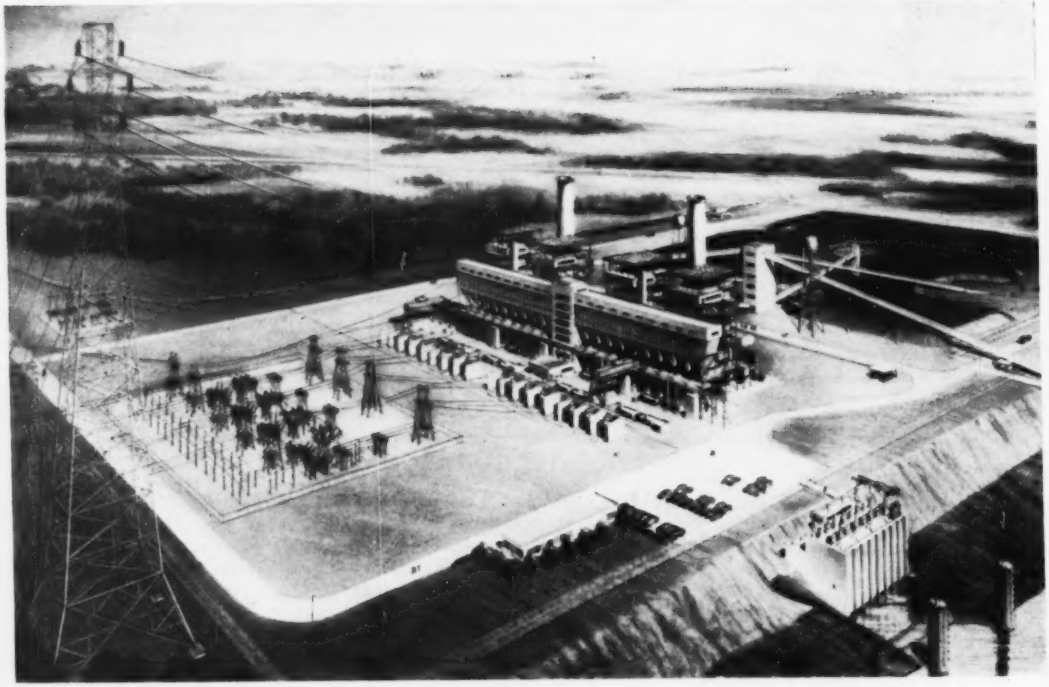
Load center distribution gives the farm adequate distribution capacity both for short-time heavy-duty electrical loads, as welders, and normal loads.

Data presented in this article are typical of what is being learned from the operation of the research farm. They indicate the potentiality of the fully electrified farm as a market for equipment and as a user of power.



BROODING with heat lamps means more and stronger chicks

LOAD CENTER distribution gives farm adequate capacity



OUTDOOR DESIGN and use of duplicate equipment for Joppa Plant will speed construction, cut requirements for materials and reduce first cost. Initial capacity of 650,000 kw is largest block of steam power ever to be built in one program

Joppa Design Minimizes Enclosure

Electric Energy Inc plant in Southern Illinois to have total capacity of 650,000 kw. Identical design of four turbine-boiler units and minimum plant enclosure cuts engineering and construction time and costs for plant supplying AEC project

PAUL E. GOURDON, Chief Mechanical Engineer
Ebasco Services Inc, New York

Outdoor design of Electric Energy Inc's 650,000 kw Joppa (Ill.) plant will reduce investment cost, expedite construction, and conserve critical materials. This plant, now building, is one of the largest steam-electric stations ever to be built in one program. Moreover its location is the farthest north of any outdoor station reported to date.

The Joppa Station is across the Ohio River from the Atomic Energy Commission's Kentucky Area Project. It will supply half of the million kilowatts of power the AEC project will require.

Location and Site . . . Location of the Joppa plant was selected by analyzing the important requirements such as relative nearness to the AEC plant, availability of coal at low cost, proximity to rail and water transportation, ample supply of condensing water, and convenience of connection to systems of the participating electric companies.

Foundation conditions at the selected site are good. Coal may be obtained from southern Illinois or western Kentucky fields, by rail or by water, and provisions are being made for receiving coal by railway car or barge. There is an ample supply of condensing water at all times in the Ohio River.

Electric Energy Inc, builders of the Joppa Plant, is a new company organized by a group of five major companies in the area as one of the con-

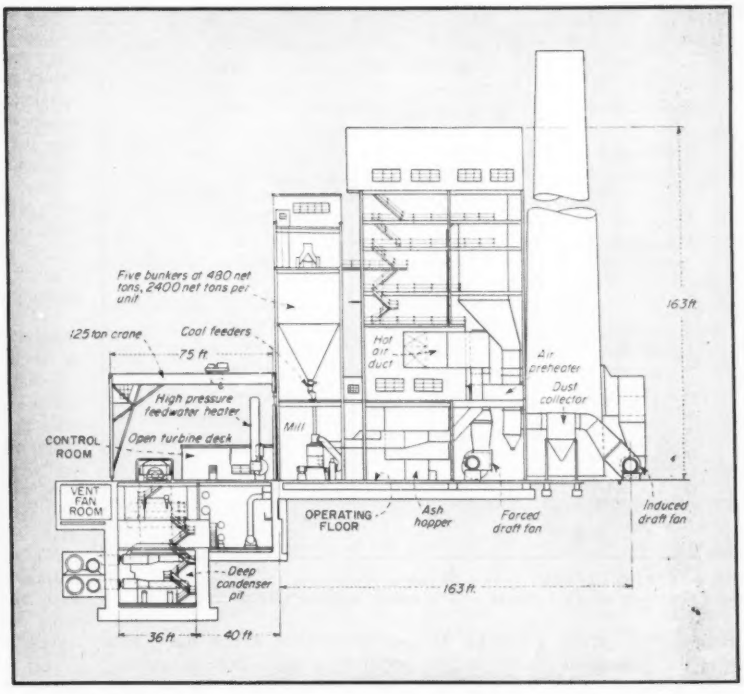


FIG 1—TURBOGENERATORS will operate on open deck above deep condenser pit. Space in pit will house pumps, heaters, major portion of electrical switchgear, and generator exciters

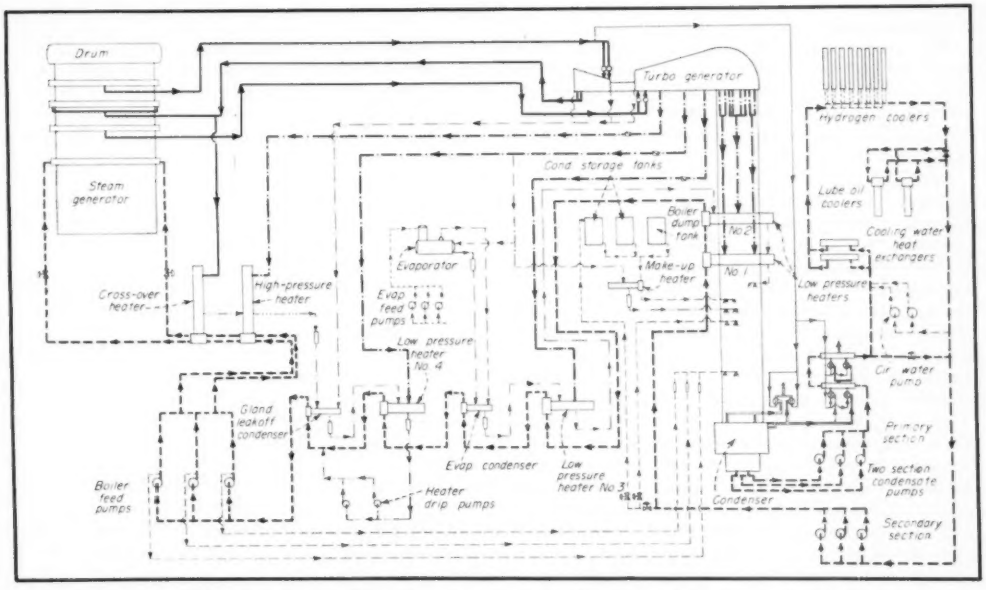


FIG 2—STATION CYCLE is based on condenser deaeration to eliminate structure for separate deaerator. Two feed and condensate pumps can carry full load for each unit. Third set of pumps comes on automatically if necessary

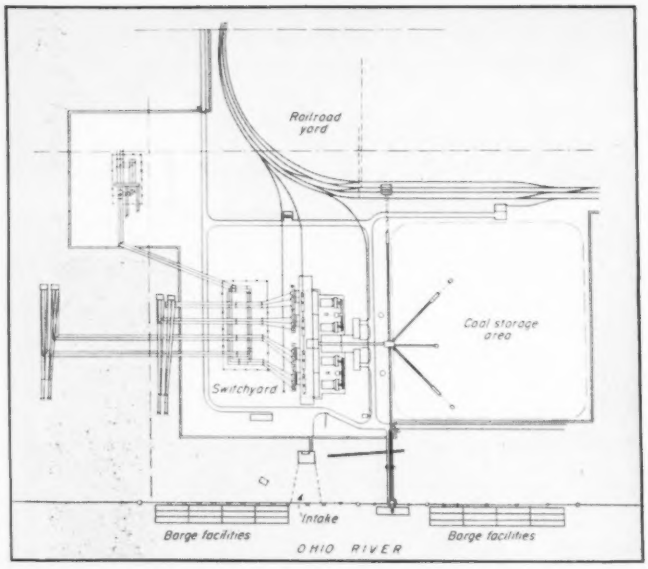


FIG 3—STATION LAYOUT is at right angles to the river. Switchyard is to windward of station and coal storage area to reduce insulator contamination

tributions of private enterprise to meet the tremendous electric energy requirements of the defense program. The five companies are Union Electric Co. of Missouri, Central Illinois Public Service Co, Illinois Power Co, Kentucky Utilities Co, and Middle South Utilities Inc.

The other half of the million kilowatts required for the AEC Project is to be supplied by a plant being built on the south side of the Ohio River under the supervision of the Tennessee Valley Authority.

A rapid construction program is required at Joppa. Decisions as to plant location, general layout, and major equipment had to be made within a very brief period, requiring the closest coordination between Electric Energy Inc and Ebasco Services, Inc. To fit into this requirement, each boiler-turbine unit is identical with the others, all units being of the same "hand."

No cross connections are used between units, except necessary auxiliary electrical connections and general facilities such as service water and compressed air. It was therefore possible to design all arrangement, piping, and other details for one unit only, with all four units constructed from the same drawings. This resulted in simplification of engineering and design, and in reduction in cost and in time required for engineering and construction. Ebasco Services, Inc, are providing engineering, design, supervision of construction, and other services associated with the planning and construction of the plant.

Turbine-Generator Characteristics . . . The four steam turbine-generators are located on an open deck at ground level, in keeping with the outdoor design. Walk-in housings are provided at the steam ends. Units are designed for a net output of 163 mw. They are supported on walls of the condenser pit, as shown in Fig 1 on the preceding page.

Normal capability rating of each unit is 156,250 kw. At 0.85 pf they are rated at 150,000 kw, giving 176,470 kva with 0.5 psig hydrogen and 216, 178 kva with an increase of hydrogen pressure to 30 psig.

Steam conditions are 1,800 psig, 1,050 F with reheat to 1,000 F. The design provides for a maximum of 3.5 in. Hg (abs) back pressure. Turbines are tandem triple-compound, triple-flow units.

Each unit is served by 500-kw, 375-v separate motor-driven exciter with special built-in flywheel and shaft-end amplidyne pilot exciter. One spare exciter is provided.

Steam Generators . . . Steam generating plant consists of four units, one for each turbine-generator. Each steam generator is designed to deliver continuously 1,200,000 lb per hr of steam when fired with coal of 10,000 Btu per lb and carrying 15% moisture and 15% ash as received.

Each steam generator is equipped with two forced and two induced-draft fans and a mechanical dust separator. There are five pulverizers per unit. Compressed air is used in the soot blowing equipment.

Plant Cycle . . . Cycle of the station is based upon condenser deaeration, eliminating the high structure required for a separate deaerator. There are six stages of extraction from the turbines, a gland seal leak-off condenser, and an evaporator and high-heat-level condenser. All but two of the extraction feedwater heaters have built-in drain coolers. Connections of heat exchangers, with draining and venting arrangement are show in Fig 2. For each unit there are three feed and three condensate pumps, all motor-driven.

Any two feed pumps and two condensate pumps carry full load. The third set of pumps comes on automatically upon the loss of any of the operating pumps or upon a reduction in system frequency below the normal frequency value.

Miscellaneous coolers, such as for air compressors and bearings, are all connected in a closed system, which utilizes condensate for the cooling medium and circulating water to cool the condensate.

General Arrangement . . . The condensing-water intake is placed at the bank of the river. The station is located about 500 ft inland. The plant is oriented at right angles to the river. Fig 3, with condensing-water conduits running parallel to the station. Steam generators are placed in a row paralleling the turbine-generators, the boilers rising from an elevation approximately the same as that of the turbines.

Two 125-ton gantry cranes are supplied for serving turbine units and other equipment. This crane capacity is required for handling the very heavy generator stators during their installation.

Figure 3 shows particularly the arrangement in the immediate vicinity

of the station. At the bottom of the view is shown the line of the river bank, the facilities for landing of barges, and the intake location. At the right of the sketch is shown the coal storage area. At left is the switchyard area, with outgoing lines, and at the top, service connections to the railroad.

Arrangement of boilers, turbines, transformer equipment, and other features is delineated in Fig 1. This illustration shows the deep condenser pit and turbine deck, with space under the deck for certain equipment. Also shown are the vertical high-pressure feedwater heaters on the deck, and at the right, the boiler equipment, with fuel preparation plant and forced draft and induced-draft fans.

Area under the turbine slab houses not only the main condensers but also condensate pumps, boiler feed pumps, low-pressure extraction heaters, the major portion of the electrical switchgear, and the generator exciters.

All piping and conduits from the condenser pit and general area leading above ground are brought out in four chases, symmetrically located with respect to their units.

Buildings provided include a one-story administration building, an eight-story structure housing general service functions, a low building for miscellaneous stores, and a building for repair of trucks, locomotives, and bulldozers. Design takes account of earthquake conditions. The highest structures are the steel supports of the boilers, the stacks, and the water-tank towers. The unusually high service building, between steam generators No 2 and 3, is nearly as high as the boilers, utilizing that central space in an economical fashion.

Coal and Ash Equipment . . . Coal may be received by barge, being unloaded by grab buckets swung from an unloading tower, or by rail, being unloaded by a car dumper, with auxiliary car shake-out. At continuous full load on the plant, between 7,000 and 8,000 tons of coal will be consumed daily by the boilers.

Coal handling for the plant consists principally of a conveyor-belt system with a general capacity of 800 tons per hr. A single 42-in. belt runs from barge unloader and from point of receipt by rail to the top of the crusher house. Two reclaiming hoppers are provided with belts, handling 400 tons per hr each to the same point.

In the crusher house, two crushers are preceded by scalping screens. Sampling equipment is provided. From the bottom of the crusher house a single belt, equipped with a vertically pivoted boom at its end, provides for storing of coal. Two belts are provided from crusher house to station, with a single distributing belt and tripper carrying the coal to each pair of boilers.

A hydraulic ash-handling system is laid out to handle the steam generating units in pairs. The furnace-bottom ash and the fly ash from each pair of units are introduced into a central sump between the two boilers. From each of these ash-receiving sumps the refuse is carried hydraulically to the fill areas.

Condensing-Water System . . . The circulating-water intake is at the river bank. Water is pumped from there to the station. Condensers are located in the basement pit, at an elevation suitable for full siphon action with river levels between normal pool at 290, referred to mean sea level, and maximum flood of record at approximately 343. Provisions have also been made for satisfactory operation at extreme low river level of 275, which may occur at infrequent intervals when the navigation dam wickets are down. Two circulating-water conduits

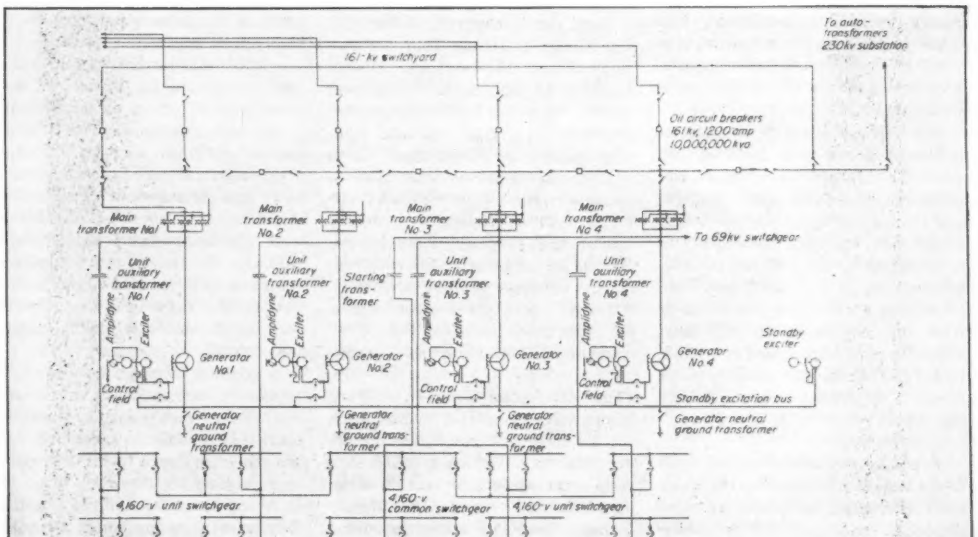


FIG 4—ELECTRICAL LAYOUT has each generator connected directly to 161-kv switchyard through three single-phase transformers. One 3-phase auxiliary transformer taps off each main generator lead to supply station auxiliaries

are run from the intake structure, alongside the pit. Arrangements are made within the building for back circulation for condenser cleaning.

River-water temperature varies between a minimum near 40 F and a maximum of approximately 85 F, which will give a usual range of condenser back pressures of from less than 1 in. to approximately 2.5 in. Hg (abs). Expected net capability of each plant unit at generator voltage is 163,000 kw. This is after provision for plant auxiliaries, with 1.5-in. Hg (abs) average back pressure figured as obtainable with Ohio River water, and is with full extration from six points and with an allowance for evaporating the makeup.

Surface condenser serving each turbine has 90,000 sq ft of surface, being of the two-pass divided-water-box type. Circulating water for each condenser is supplied by two vertical pumps at intake. Condenser deaeration of feedwater is adopted. Two heat exchangers are mounted in the long condenser neckpiece, between the exhaust of the turbine and the shell of the condenser.

Step-Up and Switching Station . . . Each generating unit is connected to the 161-kv switchyard through a bank of three, 56,000/70,000-kva single-phase, OA/FA transformers. One spare single phase transformer is provided for the four transformer banks. Electrical diagram for the station is shown in Fig 4.

One 3-phase auxiliary transformer is tapped off the main leads of each generator to furnish power for the unit auxiliaries. Auxiliary power distribution is at 4,160 v and 480 v. A fifth transformer, fed from the 69-kv tertiary windings of the 230/161-kv autotransformers in Central Illinois Public Service Co's Joppa substation or from that company's 69-kv system, serves for plant start-up and as a standby for each of the unit auxiliary transformers. If desired, this transformer can supply power to the common station auxiliaries.

A 161-kv switchyard located west of the station was placed to the windward side, based on prevailing wind directions, and coal storage downwind, to eliminate deposit of coal dust on insulators. Switchyard connections provide a modified ring bus, with a total of nine 161-kv oil circuit breakers for the four generating-unit transformer banks, the four 161-kv transmission lines to the Atomic Energy Commission substations, and connection to the Central Illinois Public Service Co 161/230-69-kv substation.

The 161-kv oil circuit breakers have these ratings: interrupting capacity, 10,000,000 kva; circuit-opening time, 3 cycles; circuit-closing time, 10 cycles; reclosing time, adjustable from 15 to 45 cycles. The 161-kv circuit breakers controlling the 230-kv line to other power systems to the north are arranged for automatic instantaneous reclosure.

Transmission Lines . . . Four 161-kv transmission circuits extend from the generating-station switchyard to river crossing towers, thence across the Ohio River and to two AEC substations on the easterly side of the Kentucky area project. Total distance is nearly 10 mi.

The river crossing consists of two double-circuit steel tower lines approximately 650 ft apart, with crossing spans of about 4,700 ft. Conductors are 1,061,000 cir mil high-strength ACSR cables, supported by 16 insulator units per suspension string. Overhead lightning shield wires are provided.

From the river crossing to the AEC substations, there are four separate single-circuit 161-kv lines. Power conductors are 1,033,500-cir mil ACSR, supported by 11-unit suspension insulator strings. Overhead lightning-shield wires are provided. These circuits are carried on wood-pole H-frame structures from Kentucky terminal of river crossing to boundary line of AEC property. Poles for this section are of Douglas fir, with full-length creosote pressure treatment. From AEC property boundary line to the AEC substations, the 161-kv circuits are on single-circuit steel towers.

Plant and System Control . . . Four compact-design control boards, each for the control of one boiler-turbine-generator unit, will be installed in a main centrally located control room, air-conditioned and acoustically treated. There is a miniature outline of major units of apparatus on the face of the control board. It shows equipment such as boiler and accessories, induced and forced draft fans, turbine, condenser, generator, and exciter. The arrangement is such that the power production process from fuel to generator output can be followed readily. The instruments and gages associated with a specific piece of apparatus are, so far as practicable, confined within its miniature outline area. To present to the operator a clear picture of the function he is observing or controlling, the principal runs of piping and electrical circuits are likewise shown in mimic form, and are identified by distinctive colors for the respective functions.

High-speed differential relays employing the product-restraint principle are provided for the protection of each generator. A voltage relay is connected in the neutral of each generator, through a distribution transformer and resistor, for tripping the generator off the system in case of a ground fault between windings and machine frame or on the generator leads or connected facilities. Percentage-differential relays are used for transformer and bus protection. Phase-comparison carrier-pilot relays with current - polarized ground - directional back-up relays are used for protection of the 161-kv lines between the Joppa plant and the AEC substations across the river.

Electric Energy Inc will have a system load dispatcher at the Joppa plant, who will be responsible for the power supply by Electric Energy Inc to the AEC load, and for control of net interchange of power on the tie lines to adjacent systems. The area load-control equipment includes an automatic loading feature for each generator. This arrangement permits the dispatcher to select a rate at which load may be increased or decreased automatically, to load or unload a generator up to the load-control point. That point is determined manually by the load dispatcher or by the system load control.

In addition to telephone-wire communication circuits, both microwave and carrier facilities are provided. Carrier communication channels are laid out from Joppa to the Kentucky area project, the Shawnee plant of TVA and Kentucky Utilities Co, and microwave communication channels from Joppa to the northern utilities. It is planned to use space radio as back-up for the carrier communication channels.

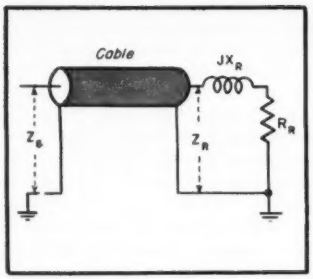


FIG 1—SHORT LENGTHS of low-loss cables can terminate in an impedance other than characteristic impedance

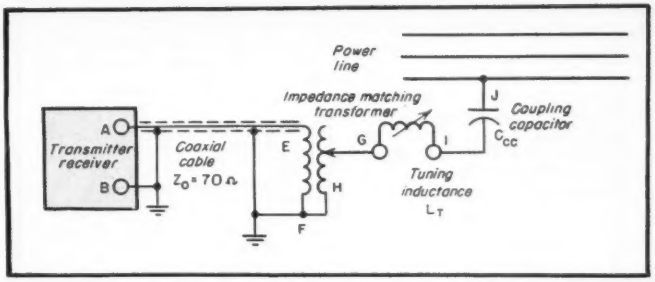


FIG 2—TYPE "A" CIRCUITS may be used with coaxial cable without limitation at conventional carrier frequencies. Tuning inductance is adjusted so reactance is numerically equal to the capacitive reactance of the coupling capacitor

Applying Carrier Current To Power Lines

A comparison of audio and carrier-frequency circuits with 60-cycle circuits in terms of wave length. Reviews types of carrier circuits and advantages of each

H. J. SUTTON, Engineer
Gulf States Utilities Co, Beaumont, Texas

Upon first comparison there seems to be very little that is common in the behavior of 60-cycle, audio, and carrier frequency circuits. But, when the length of a circuit is considered in terms of wave length, there is a basis for comparison. For example, a 60-cycle line one wave length long would be about 3,100 mi long. Practical limit of transmission line length for 60 cycles is 775 miles.

In computations of receiver end conditions for short lines, only the series impedance is considered. However, for long lines the shunt admittance must be included.

At carrier frequencies a line one wave length long for 30 kc is 6.21 mi, for 50 kc 3.73 mi, and for 150 kc 1.24 mi. From these wave lengths it is apparent that most applications of carrier current involve the use of lines several wave lengths long. Such lines are extremely long, in terms of wave length, compared with a 60-cycle system. A solution for the receiver end conditions can be arrived at by using the same exponential or hyperbolic equations as those used for 60-cycle application provided correction is made in the various impedances for the changes in frequency.

Load that can be placed on the receiver end of a 60-cycle line is dependent on the voltage, size of conductors, distance, economics, and stability. In the case of carrier loads, the receiver impedance should not exceed the charactertistic impedance of the connecting line if maximum received signal is desired. Stating this another way, in the case of long lines of one wave length or more, the maximum receiver load is governed by the characteristic line impedance.

Another comparison between 60-cycle and carrier frequency circuits might be made on basis of efficiency. In the case of 60 cycles, the efficiency of a line is usually 85% or higher. In the case of carrier current, the maximum efficiency usually does not exceed 10% and may be found to be as low as .001%.

Referring again to line impedance, the forward or incident wave emitted from the transmitter travels down the line. If the receiver end impedance is equal to the characteristic impedance of the line then all of the forward wave is absorbed in the receiver load and the impedance, as seen from the sending end, will also be equal to the characteristic impedance. Should the receiver impedance be unequal to the characteristic or surge impedance of the line then a portion of the energy will be reflected back toward the sending end, thus introducing both distortion and extra losses.

Two types of lines are used for the transmission of carrier waves. One is the power line, the other is the coaxial cable lead-in conductor. At carrier frequencies the characteristic impedance of a power line usually is found to be between 300 and 600 ohms.

Coaxial cable is used to connect indoor carrier equipment with the outdoor tuning and coupling equipment. This cable usually has a characteristic impedance of from 60 to 70 ohms.

Short lengths of low-loss cables, 200 ft and less, can, by exercising care, be terminated in an impedance different from the characteristic impedance, as shown in Fig 1.

As the length of a coaxial cable in-

As adapted from paper presented at the Fourth Annual Conference of Protective Relay Engineers, College Station, Texas

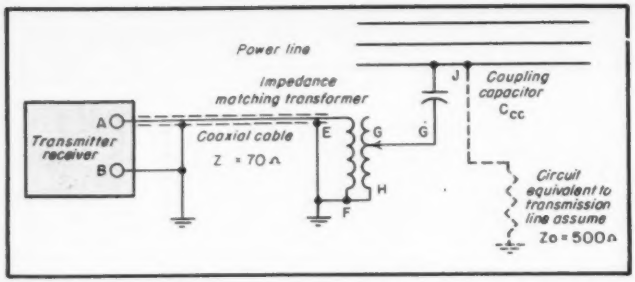


FIG 3—TYPE "B" CIRCUITS are same as type "A" except line tuning inductance, GI, of Fig 2 is omitted. Circuit also uses impedance matching transformers

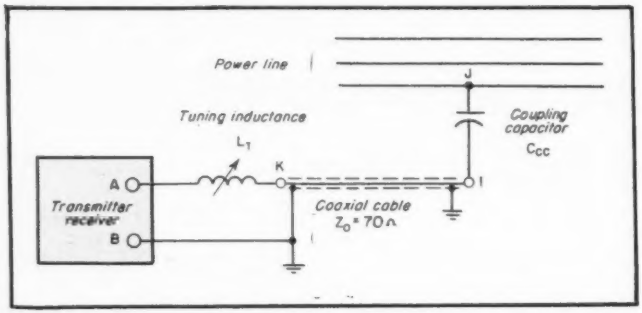


FIG 4—TYPE "C" CIRCUITS are tuned when sufficient inductive reactance is added to counteract capacitive reactance as seen at sending end of cable

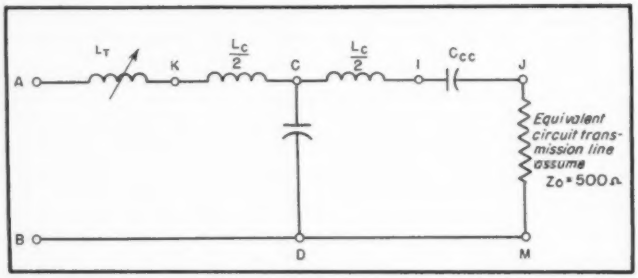


FIG 5—TYPE "C" CIRCUIT is represented schematically in this manner. The tuning inductance is located inside the transmitter-receiver cabinet

creases beyond 200 ft it becomes more important to terminate the cable in an impedance equal to the characteristic impedance of the cable.

Practical Applications . . . When coaxial cable is used, three types of line tuning circuits might be used. To assist in the discussion[1], the circuits are called Types "A," "B," and "C."

The Type "A" circuit, shown in Fig 2, may be used with coaxial cable without limitation at conventional carrier frequencies. In this circuit the tuning inductance is adjusted so that its reactance is equal numerically to the capacitive reactance of the coupling capacitor. By properly tuning this circuit the load appearing across point G to ground is a resistive load of slightly higher value than the characteristic impedance of the line.

A transformer EFGH is used for matching the line impedance to that of the cable. Winding EF is connected to the cable. The connection to the GH winding is adjusted so that the resistive load mentioned above appears as a 70 ohm load across the EF winding. The cable is then matched to its characteristic impedance thus providing a high efficiency circuit without distortion from reflected waves.

The Type "B" circuit, Fig 3, is the same as the Type "A" circuit except the line tuning inductance GI of Fig 2 is omitted. To tune this circuit the connection to winding GH is varied so that the load on this winding appears as a 70-ohm load across the EF winding. The impedance matching transformers used on this type circuit introduce inductive reactance which partially counteracts the capacitive reactance of the coupling capacitor. This type circuit gives very good performance when the coupling capacitor is .00275 microfarads or greater and the coaxial cable does not exceed 400 ft.

The type "C" circuit is connected as shown in Fig 4. The equivalent circuit is shown in Fig 5. In this case the tuning inductance is located inside the transmitter-receiver cabinet. This circuit will be tuned when sufficient inductive reactance is added to counteract the capacitive reactance as seen at the sending end of the coaxial cable.

Use of Type "C" circuit is limited because the coaxial cable is not terminated in an impedance approximately equal to its characteristic impedance. Because this circuit is not matched with the cable, the problem of distortion from reflected waves becomes more troublesome as the length of cable increases, or as the frequency increases. If the use of this circuit is confined to short length of cable, approximately 200 ft or less, or to low frequencies 100 kc or less, the behavior of the coaxial cable will approximate that of a simple conductor. The amount that the foregoing range can be extended is dependent upon the impedance of the coupling capacitor and the amount of distortion which can be tolerated.

Advantage of both the Type "B" and "C" circuits over the Type "A" is in simplicity. The coaxial cable can be terminated in the base of the coupling capacitor thus eliminating an outdoor tuning cabinet. The advantage is even more apparent when considering by-passes. However, as has been implied, the wave length of the carrier affects the use of the Type "B" and "C" circuits.

Applying Wave Traps . . . Wave length

of a particular carrier frequency also affects the necessity of using wave traps on a carrier circuit. If the line being used for a carrier channel has a tapped or spur line of ¼, ¾, 5/4, 7/4, 9/4, etc, wave lengths long connected to it, then that tap line will act as a low impedance circuit and the spur line must be trapped or another carrier frequency used.

Reason for this can be seen by considering the example of a ¼ wave length tapped line. The carrier wave traveling down the line splits at the tap, and a portion will travel down the main line and the other portion down the tapped line. The carrier wave travels to the end of the spur line and since a power transformer usually has high impedance at carrier frequency most of the wave will be reflected back to the junction point. At this point the reflected wave will lag the forward wave by 180 deg.

A tapped line may account for as much as 20 to 30 db loss. Fig 6 shows the results of an attenuation curve run on a 69-kv line between Baton Rouge, Louisiana, and Beaumont, Texas. The dotted curve between 47 and 55 kc shows the effect of adding double frequency traps, tuned for 51 and 68 kc on two tapped lines.

[1] Permission has been obtained from AIEE to use extracts from Paper 49-6 "Line Tuning Equipment Used With Coaxial Cable For Carrier Current Installation On Power Lines."

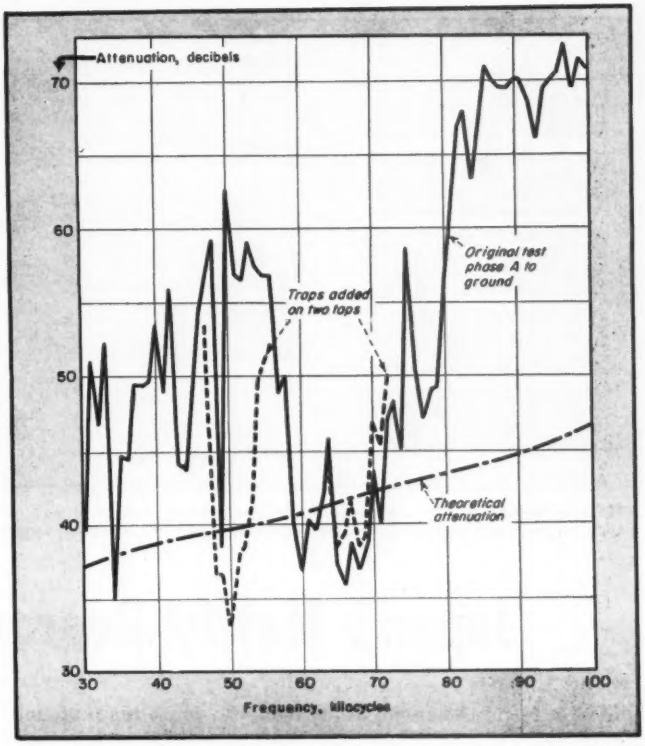


FIG 6—WAVE TRAPS reduce attenuation as shown by effect of their installation on Baton Rouge-Beaumont line. When original test was run there were single frequency traps tuned for 68 kc at both terminals of the 69-kv transmission line

Use Max-Min Thermal Unit To Measure Voltage

J. A. MORRIS
Meter and Service Engineer
Electrical Engineering Division
American Gas & Elcctric Service Corp
New York, N. Y.

To indicate approximate maximum and minimum voltages at specific points on the AG&E System, we are applying the recently developed thermally time-lagged outdoor maximum-minimum voltmeter. It is relatively inexpensive, easy to apply to primary lines, easy to read, and requires little or no maintenance.

This device is basically a thermal voltmeter whose actuating force is proportional to the square of impressed voltages, rather than the values associated with the customary voltmeter. This thermally actuated meter is not perceptibly affected by momentary fluctuations of voltage, or flickers of short duration, but has the characteristic response of all instruments operating on the thermal principle. Central pusher pointer attached to the actuating element is free to push adjacent friction-retarded maximum and minimum indicators. Consequently, these indicators do not show instantaneous voltage peaks or valleys but rather time-lagged values which smooth out momentary fluctuations. These indicators may be easily reset to existing voltage merely by turning a knob on the instrument.

Installations are being made at newer distribution stations by mounting the meter on an outdoor socket base and connecting it through a potential transformer, where required, to the station bus. This provides values of minimum and maximum voltage supplied by the bus to the distribution feeders.

This maximum-minimum voltmeter is not suitable for voltage surveys or investigations of customers' voltage complaints where it is necessary to have a detailed, continuous voltage-record showing all fluctuations over an extended period.

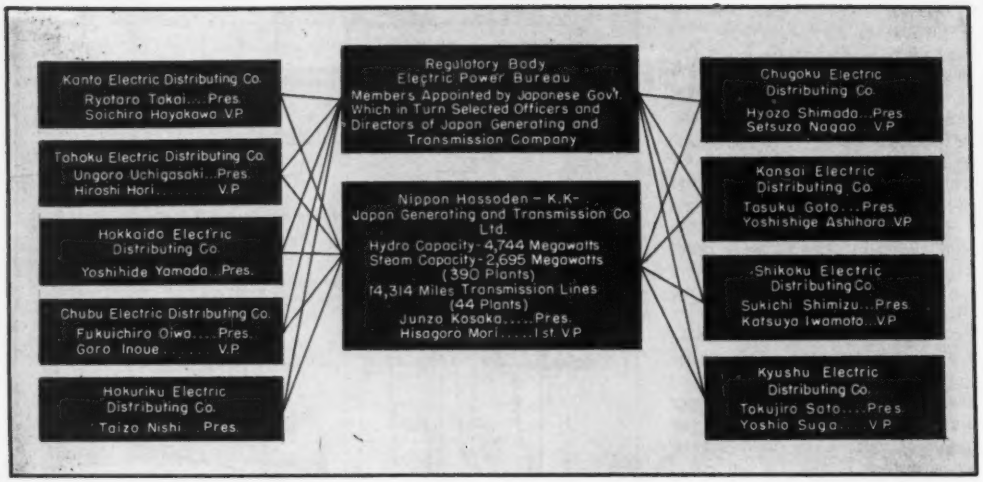
Advantages of the thermal maximum-minimum voltmeter include:

1. Low initial cost including socket mounting. Less than 10% as costly as customary graphic meters with weatherproof cabinets.

2. It can be mounted exposed to the weather and connected to any primary circuit through a potential transformer. Scale can be calibrated for either primary voltage or equivalent secondary voltage.

3. Easily read by inexperienced help. Examination and analysis of indications are not time-consuming.

4. Easily reset to existing voltage at any time.



BEFORE REORGANIZATION a single generation and transmission company and nine affiliated distribution companies controlled 90% of power resources and nearly all the power business. A control Bureau was appointed by the government

Japan's Newly Reorganized Power

Told here by the American utility man who wrote the reorganization order is the story of how Japan's monopolistic power industry was recast in the private enterprise pattern. What the job was, why it had to be done, and forces that opposed it are defined

EDWARD J. BURGER*

Industry Management Member, Deconcentration Review Board

After nearly two years of bickering and political log-rolling nine new fully-integrated power companies have recently been formed to supply the power requirements of the Japanese nation. These nine new companies replace ten others that comprised the Japanese power industry at the end of the World War II. In addition to forming these companies, the Japanese government has created a National Utilities Commission following jurisdictional limits and theories of regulations found in state regulatory bodies in the United States. This reorganization of the Japanese power industry has followed, very closely, the recommendation of a five-man board sent from the United States to advise General MacArthur on matters dealing with the reorganization of large industrial companies regarded as monopolistic and marked for dissolution under the established occupation law.

The five members of the board were: Roy Stuart Campbell, chairman; Joseph P. Robinson, engineering member; Edward J. Burger, Industrial Management member; Byron D. Woodside, Security Exchange Commission member; and Walter P. Hutchinson, Anti-Trust member.

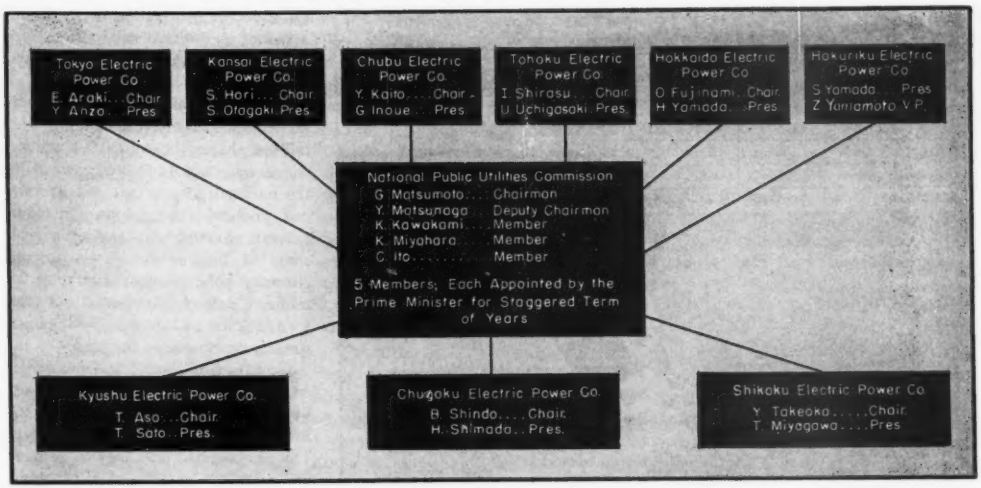
Reorganization of the Japanese utilities had its roots in articles of the post-surrender agreement stating that "large Japanese combines would be broken up."

How Reorganization Began . . . Initial steps were taken when, in 1945, the Allied Powers moved into Japan and put the agreement to work. The Japanese Diet passed laws authorizing the Zaibatsu or large Japanese holding companies to be dissolved. This freed the large operating companies, controlled by the Zaibatsu.

Early policy, at high levels, deemed it advisable that in addition to breaking up the holding companies and purging the executives, it would be necessary to force reorganization of the larger operating companies. Therefore in December 1947, by directive of the Supreme Commander for the Allied Powers, the Japanese Diet passed a public law (No. 207) designed to eliminate excessive concentrations of economic power.

Under this law some 325 large operating companies as well as larger banks and insurance firms were designated for reorganization. Prominently named in the list was the Japan Generating and Transmission Co and its nine distributing companies. These firms controlled more than 90% of power resources in Japan and nearly all the power business. Thus they were regarded as monopolistic, an

* Author Burger is currently manager of Ohio Edison's Lake Erie Division, Lorain, Ohio



REORGANIZATION dissolved the former generating and transmission company and nine distributing companies. In its place nine fully integrated and independent power companies were created, controlled by national public utilities commission

Industry Is Patterned After Ours

excessive concentration of economic power, within the meaning of the law.

Five-Man Board Formed . . . But by the early months of 1948 those responsible for our Far Eastern foreign policy had become aware of changes in the International situation and deemed it unwise to pursue longer a policy of pulverizing companies representing the backbone of Japanese commerce and industry, at least to a point where it might inhibit recovery of the Japanese economy. Therefore, to provide a balance wheel against over-decartelization, a board was formed in May 1948, composed of five members from the United States, charged with reviewing all proposed reorganization orders. This board was authorized to recommend directly to the Supreme Commander whether proposed plans should be approved, stayed, or modified.

The case of the Japan Generating and Transmission Co and the nine distributing companies came before this board early in 1949. After considering a study and reorganization plan submitted by the Gas and Electric Unit of S.C.A.P's Industry Division the Board agreed that the ten companies were an excessive concentration of economic power and came within the meaning of the law 207.

The reasons for this finding were two: (1) Before World War II Japanese power resources were controlled by 33 privately-owned power companies operating in competition. In 1938 the Japanese government forced the merger of the privately-owned companies into ten corporate entities under designation. (2) There was no adequate governmental regulation. The Japan Generation and Transmission Co owned and operated nearly all of the electric generating and transmission facilities on the four islands that comprise Japan. Electric power generated and transmitted by the big generating company was taken and distributed by nine distributing companies, each in their respective areas. While the distributing companies had the outward appearance of being privately owned, it was not really true.

In 1949 the generating company had 29.4 million shares of stock outstanding among 165,000 stockholders.

Who's Who On the Deconcentration Review Board

Roy S. Campbell, Chairman . . . Marine Engineer and authority on ship building, previously with the New York Ship Building and Bethlehem Steel Companies. Shortly after the completion of the Board's work, he was awarded the honorary degree of Doctor of Engineering by the University of Michigan.

Byron D. Woodside . . . Specialist in corporate analysis and reorganizations, a member of the Securities Exchange Commission at the time of appointment to the Board.

Edward J. Burger . . . At the time of appointment to the Board, a vice president and director of the Ohio Public Service Company. Previously served as a member of a utilities consulting group on reparation problems as affecting the electric utilities in Japan.

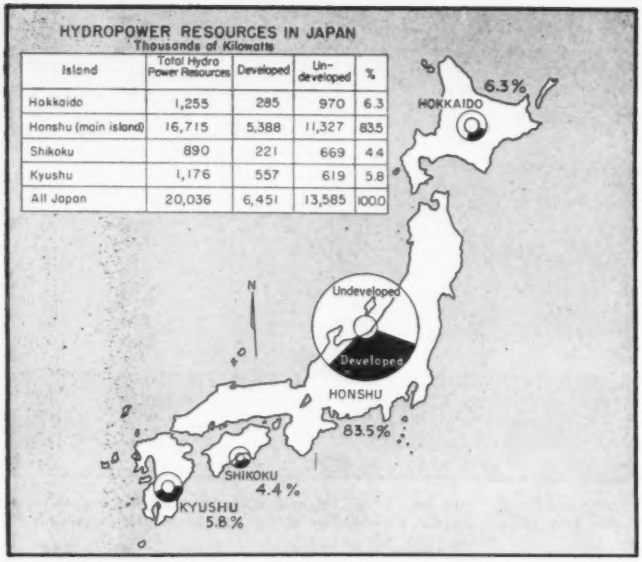
Walter R. Hutchinson . . . Attorney and specialist on anti-monopoly law, formerly with the Department of Justice.

Joseph P. Robinson . . . Industrial Engineer.

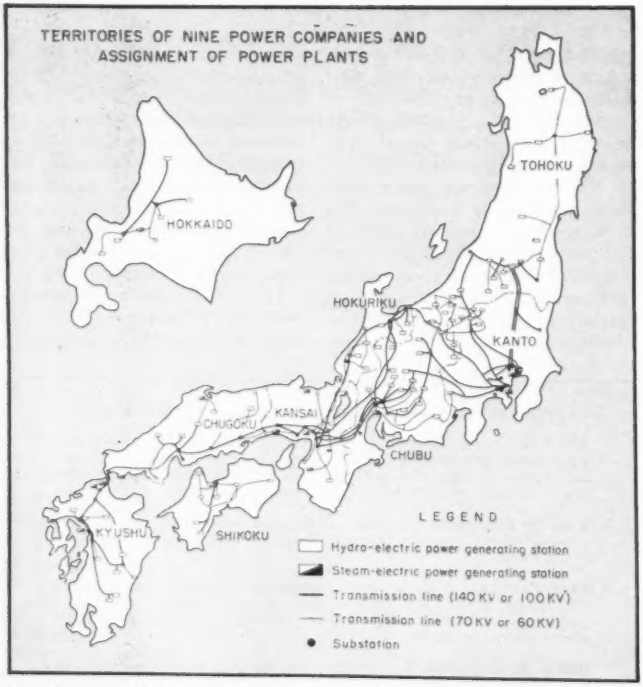
HYDROPOWER RESOURCES IN JAPAN

Thousands of Kilowatts

Island	Total Hydro Power Resources	Developed	Undeveloped	%
Hokkaido	1,255	285	970	6.3
Honshu (main island)	16,715	5,388	11,327	83.5
Shikoku	890	221	669	4.4
Kyushu	1,176	557	619	5.8
All Japan	20,036	6,451	13,585	100.0



HYDRO CAPACITY in Japan is mostly run-of-the-river type but there is reservoir capacity equivalent to about 700 million kilowatt hours. Steam capacity is less than 4,000,000 kw. Present and potential hydro capacity amounts to 20,036,000 kw



NINE NEW COMPANIES now supply power requirements of four Japanese islands. In 1948 there were 14,558,000 customers. Energy sales aggregated 23 billion kilowatt hours. Standard transmission voltages range from 11 to 154 kv

Of these the national government and 1,347 of its political subdivisions represented by prefectures, cities, and villages owned 5.5 million shares or 19% of the total. The nine distributing companies had outstanding 71.5 million shares, of which 9.1 million shares or about 11% were owned by the national government and its various political subdivisions. In addition there were outstanding against some of the ten companies foreign currency bonds in the amount of 26 million dollars distributed in the United States and three million pounds sterling distributed in England.

Government control and regulation were maintained by an Electric Power Bureau appointed by the minister of International Trade and Industry. This Bureau had authority to appoint the president and the vice president of the generating and transmission company and to choose the directors from candidates nominated by shareholders of the company. It had jurisdiction over water resources, hydrogeneration, utility personnel, audits and accounting, electric rates, fuel and material allocation, and many administrative matters. This type of regulation was considered neither adequate nor equitable.

Operating Peculiarities . . . Although the ten companies were corporate entities, they were not treated as such in accounting matters. For instance, uniform rates were charged throughout the entire nation, despite large differentials in production costs between the various areas. Balance sheets and earning statements were not provided for each of the operating companies but were invariably consolidated for the ten companies. The generating company charged each of the distributing companies for power supplied over the transmission system on the basis of the ability of each to pay. Such an arrangement not only represented an inequity to the users of electric service in the various areas supplied, but to the holders of the equity stock in each of the ten companies.

The problem of the five-man Board in recommending a plan of reorganization was complicated by many inherent political ramifications. There were certain factions that had selfish interests. Each tended to influence the Board's actions. Under the ex-

isting system the Japanese government controlled the electric power industry with its 146,000 employees through its Electric Power Bureau. In addition, officials of the generating company looked with disfavor upon any change, except integrating the entire industry into one company.

Criteria of Reorganization . . . In studying the problem the Board gave consideration to five criteria: (1) Selection of the kind of ownership—public or private—that would best serve the industry was vital. (2) Operational and engineering factors were give first consideration so that whatever reorganization plan was adopted would provide a satisfactory basis for power interchange. This was important since many areas were short of capacity, and considerable time would elapse before enough increases could be made. (3) It was understood that administration of the reorganized company or companies was a vital factor. Each of the new companies had to be staffed with competent executives and technical assistance. (4) Since the stockholders in the ten companies had lost considerable confidence as indicated by the low prices of shares on the exchange, the reorganization plan had to be one that would not be difficult to administer and that would attract new capital. (5) Last but not least, was the important problem of proper regulation of the industry.

The recommendations of the Board may be reduced to two parts: (1) That the Japan Generating and Transmission Co and the nine distributing companies be dissolved and that seven fully-integrated independent power companies be created in their stead, and (2) that a national public utilities commission be formed to take the place of the former Electric Power Bureau.

Seven companies best fitted the requirements, since the physical boundaries of that number of companies could be delineated in accordance with the seven load dispatching areas of the Japan Generating and Transmission Co. Such an arrangement would have provided the utmost freedom in power transfer between companies. However, the final selection of nine companies appears to have been a compromise.

Further, the Board made certain recommendations as to the jurisdiction and authority of the proposed commission: (1) Provision for uniform system of accounts; (2) complete regulation of utility financing; control of new construction and abandonment when in the public interest; (3) enforcement of territorial limits with respect to both public and privately owned utilities; (4) control and conservation of the nation's water resources; (5) approval of interchange power agreements and the enforcement thereof; (6) and the regulation of rates and earnings.

Particularly pertinent in the Board's recommendation was: "The jurisdiction and authority of the proposed commission be limited to matters pertaining to surveillance and regulation of the nation's public and privately owned gas and electric utilities, and that it not be construed in any sense an administrative body to be established for the purpose of engaging in the operations or joining in the management of any of the utility companies. The commission should be limited to the licensing of only one electric utility in each of the seven power areas, except that, however, any political subdivision of the government shall have the right to acquire or construct and operate a gas and/or electric utility for the purpose of rendering service to the inhabitants within its boundaries."

Ratification Slow . . . The Deconcentration Review Board presented its recommendation to the office of the Supreme Commander in July 1948. While the recommendations of the Board affecting other companies had been accepted by General Headquarters and passed without modification, the case of the power companies was an exception. Its political implications resulted in considerable hesitancy on the part of the Diet, and the necessary new laws creating the new companies were blocked. A new committee was created by the Japanese government to make a complete restudy of the entire power problem. This new 18-man Electric Power Industry Committee came up six months later with the recommendation that existing power companies on the main islands of Honshu and Kyushu remain without change and that two new companies, one on Hokkaido and another on Shikoku, be created. But again the Government failed to act on the committee's report.

Then in 1949 when the Liberal party came into control, still another study was begun by the Electric Power Reorganization Investigation Council. This group recommended that nine integrated companies be formed in each of the areas served by the present distributing companies but to be interconnected to a nation-wide power supply and interchange company. This was in effect no change from the system as it then existed.

Finally in April 1950 two bills were introduced to the Seventh Diet: one providing for the reorganization of the ten power companies into nine integrated companies, and the creation of a national public utilities commission. Once again the Diet adjourned without taking action on either bill.

G.H.Q. Takes A Hand . . . To compel the Japanese government to act in accorance with the reorganization order, General Headquarters issued notice that loans from the Counterpart fund designated to be used for the development of electric power resources would be withheld. Consequently a special session of the Diet was called on the 21st of November, 1950, and Prime Minister Yoshida was presented with a letter from General MacArthur relative to the reorganization of the electric power industry. Thus the two laws were created making effective the Electric Enterprise Reorganization and giving effect to the creation of a National Public Utilities Commission. This was accomplished by resorting to the Potsdam Ordinance which provides for the creation of laws and the enforcement thereof without the sanction of the Diet, where such action is necessary to carry out the objectives of the occupation forces, and in accordance with the Potsdam Declaration.

Thus it was that the occupation has accomplished for the Japanese that which, because of the many diverse interests and because of the deep political roots in the electric power industry, they could not have achieved for themselves. Certainly the power system as now constituted will serve as a basis for a system that will ultimately provide Japan with one of the finest power systems in the world.

We Calculate Transformer Loading From Meter Readings

Maximum demand is determined simply by totaling kwhr from customers bills and applying proper constant. Recording meters back up estimate

J. T. PUGH, Operating Superintendent
Jackson Electric Department, Jackson, Tennessee

To minimize burn-outs and low voltage complaints, and to prevent the installation of excessive transformer capacity, Jackson Electric Dept has undertaken the development of a practical low-cost method of checking distribution transformer loading.

In the early phases of this work we found our files and maps were incomplete and a field check would be necessary. Sketches prepared in this field check covered data on transformers, secondaries and services and indicated whether services were two-wire or three-wire. Referring to the office records, account numbers were put in place and the sheets carrying this information were catalogued in standard loose-leaf note books, Fig 1. These have been kept up to date by recording installation of new services and new transformers, and other pertinent information.

A group of recording ampere demand meters are kept in service constantly to check transformer loads. They indicate not only demand but also duration of peak. Several recording voltmeters are used to help point out overloaded transformers, and secondaries that are too small or over extended.

Once complete and up-to-date test data has been assembled, it is not too difficult to arrive at the correct transformer size. From the meter route books the lead surveyor lists all the account numbers involved and records the kwhr used during a hot month and a cold one, usually July and January, or August and February. These totals are divided by a factor which changes kwhr to kw on load factor basis. These factors are based on a 720 hr, 30 day month. A factor of 180 is used to convert kwhr to factor basis, and 288 to give kw on a 40% load factor basis.

Kilowatt hours consumed during any number of days may be changed to kw by dividing the kwhr by 6 x number of days for 25% load factor or 9.6 x number of days for 40% load factor. These two load factors have been used because it has been found that residential load factors are usually within these limits. Where electric heat is present, load factors may run 40% to 50% or even higher. These values are based on many checks made with recording ampere demand meters. From them a general rule of thumb has been developed for areas where one-half or less of the total kwhr comes from house heating customers. In such cases the consumption is figured at 25% load factor and 40% load factor and the nearest standard rated size transformer that is in these limits is installed.

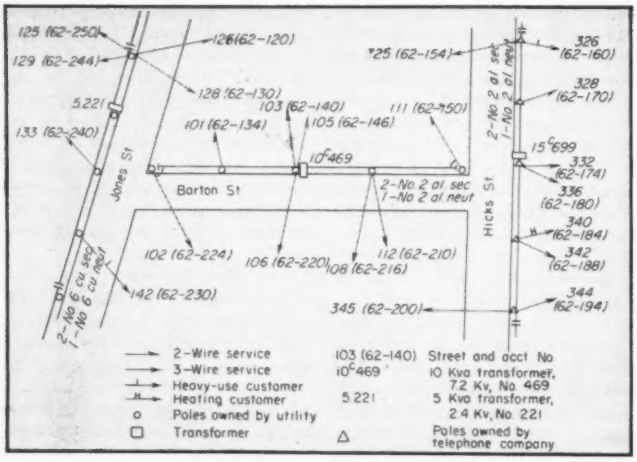


FIG 1—CUSTOMERS SERVED by each transformer were determined by field check. Findings were sketched and filed in standard loose-leaf note books

Banked Transformers . . . Banking of transformers in residential areas greatly reduces the installed capacity necessary. In one test area on a street serving 27 residences, four of which were electrically heated, the calculated load runs from 75 kva at 40% load factor to 120 kva at 25% load factor. This area is served with three "banked" 15-kva transformers.

A different approach with the ampere demand meters must be used on "banked" transformers. Since the load will divide between the transformers the true picture of the total load can be had only by installing a demand meter on each transformer in the "bank."

Figures 2 and 3 show the difference in performance of two transformers, one 25 kva and one 15 kva, serving similar loads. The smaller transformer is "banked." It furnished approximately as many kwhr as the larger one although the demand was much lower. The smaller transformer

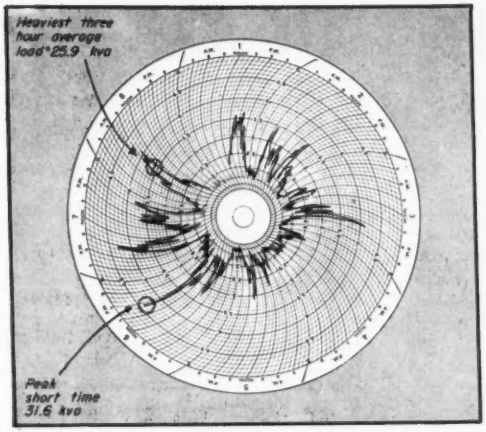


FIG 2—PEAKS on separate transformers were fewer but larger than for similar kwhr use on banked transformers. Chart was taken on 25-kva transformer supplying 2,083 kwhr for eight customers, including one heating customer, from Jan 15 to Jan 22. Calculated demand was 33.5 kva at 40% load factor

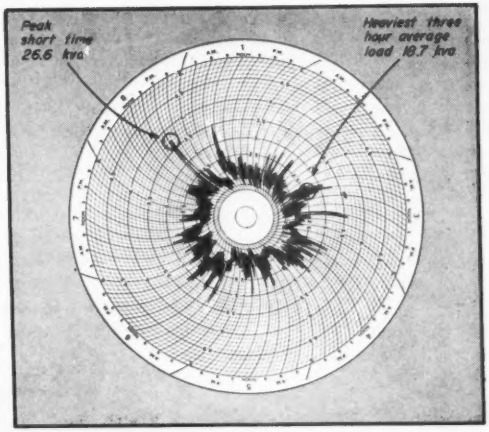


FIG 3—BANKED TRANSFORMERS of smaller sizes will supply as many kwhr as larger single units. Compare this chart on 15-kva unit with Fig 2. Load on 15-kva unit serving 11 customers for nine days was 2,483 kwhr, including two heating customers. Calculated demand was 30 kva at 40% load factor

also had many more little peaks as it divided load with adjacent units.

On banked transformers, loads will not divide properly if the distance between the two is so great that the impedance of the secondaries is too high. Ammeters installed in these locations can be interpreted as if the transformers were not banked. If the load is dividing properly however the charts will show on peak what the load is at 40% load factor.

Know Territory . . . On single transformer installations a knowledge of the area served is essential as well as the particular type of transformer involved. Many residential transformers serve drug stores, service stations and other customers which may have long hours and low demand. A consideration of these must be taken into account when the kwhr total is compared with the demand chart.

Transformer Costs By Installed Sizes

Size in Kva	Net Cost (CSP Type)	Difference In Cost To Next Smaller Size	Annual Charges**	Expense To Change To Size Shown
3	$103.00			$10.00
5	144.00	$41.00	$4.10	10.00
10	219.00	68.00	6.80	12.00
15	265.00*	53.00	5.30	14.00
25	350.00	85.00	8.50	15.00
37	450.00	100.00	10.00	20.00
50	500.00	50.00	5.00	25.00

* Conventional 15-kva type costs $230.00.
** Annual charges of 10% based on taxes, interest and depreciation.

Electric Heating . . . Electric heating presents a special problem. Actual demand for heating, checked with a 30-min interval demand meter, seldom approaches more than one-half to three-fourths of the installed capacity of heaters only. Also, energy furnished for heating increases as degree days increase and transformer capability is also almost in direct proportion to the degree days. In other words, the colder the weather the greater the allowable overload. Since almost all electric heating customers will have a range and water heater, the added transformer capacity for serving the heating load will equal one-third to one-half the kilowatt capacity of the connected heating equipment.

Economics of Selections . . . If a service man has to make more than one trip a year to reset an overloaded transformer, his expenses in labor, loss of revenue and goodwill will cost more per year than the added annual charges of having the next larger size transformer installed in the first place.

Transformer Size . . . The method of determining transformer demand at certain load factors calculated from kwhr readings has been in use on this system several years. Recently another approach to the problem has been considered. It is based on determining how many kwhr per kva

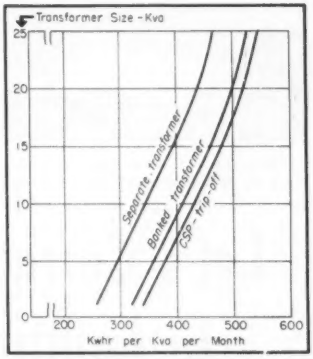
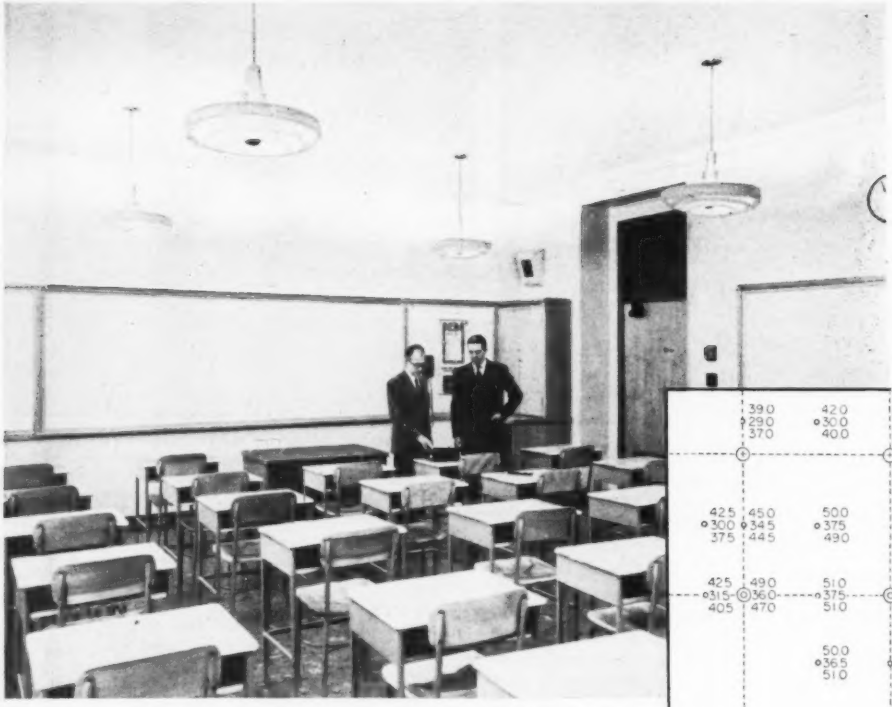
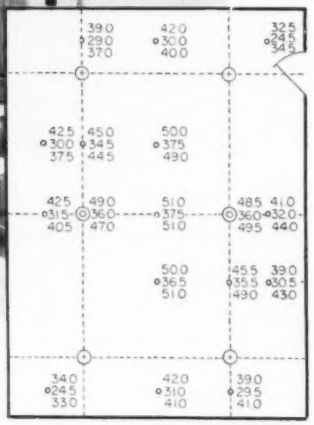


FIG 4—SIZES of transformers can be taken from curves now being developed on basis of kwhr per kva per month

can be furnished by different size transformers. It has been found that kwhr tell about the same story as kw demand if interpreted properly. Although there have not been enough data collected, curves are taking a definite shape and will furnish a basis for a much simpler method of determining transformer sizes in the future. These curves are shown in Fig. 4. They are falling about in the limits of 160% load at 40% load factor and 200% load at 25% load factor. This is not as true in the small sizes, 3 kva and 5 kva, because there is not as much diversity. The smaller sizes usually serve a fewer number of customers.



CLASSROOM in which measurements were made. Co-author Parsons shows Elmer E. Hundel, principal of the school, the amount of light on the students' desks



FOOTCANDLE VALUES taken on a horizontal plane 30 in. above the floor in accordance with the IES Standard Method. Top figure—As found 10 months after installation; Middle figure—As found 19 months after installation; Bottom—With new lamps 20 months after installation

Let's Correct the Errors In Lighting Design

Later developments in factors affecting illumination plus short-cut methods combine to affect significantly results obtained by usual handbook procedures

J. F. PARSONS, Illuminating Engineer, Niagara Mohawk Power Corp, Buffalo, N. Y.
H. M. SHARP, Consulting Engineer, Snyder, N. Y.

Calculation of lighting design data has been over-simplified, so much so as to raise the possibility of costly errors. The lumen method for calculating the average illumination on a working plane was developed by Harrison and Anderson, and the basic data published in the IES Transactions of February 1916 and March 1920. Because of its simplicity the method gained immediate acceptance. Unfortunately, to facilitate its use by laymen, the original method has been so simplified that the accuracy of present day handbook tables is in some instances open to question.

The basic concept of the lumen method is the Coefficient of Utilization for a luminaire. This is a decimal representing that portion of the generated lamp lumens that reaches the working plane. This quantity is affected by the luminaire distribution and efficiency, the room proportions, and the finishes of the various interior surfaces. The coefficient is calculated from the candle power distribution data of the luminaire and the original Harrison-Anderson Tables. Many manufacturers of luminaires supply coefficients for their products. Over the years coefficients for "typical" luminaires have been assembled in tables and included in numerous text-

books and engineering handbooks.

Unfortunately little or no attempt has been made to educate the lighting designer in the use of the basic data. Much simplification has been resorted to, and numerous errors have crept into the tables of coefficients. The result is that observed illumination values are often greatly different from the calculated values. It is possible to reduce this error by a more careful use of existing tabular data.

Room Index . . . The proportions of a room and the mounting heights of luminaires have a considerable influence on the percent of lamp lumens reaching the working plane. This is wrapped up in a package called "Room Index." Various formulas have been used to calculate it. It is expressed as a number. In the trend to oversimplification, letters have been assigned to cover a range of room index numbers. The letter is selected directly from a listing of room dimensions, mounting height of luminaires, and type of lighting. Unfortunately, the blocks are too large, resulting in abrupt changes in Coefficient of Utilization as the room dimensions vary. For instance, a change of only six inches in one of the room dimensions can change the coefficient by 20%!

The remedy is to calculate the Room Index by means of a simple formula*, obtaining a number value. The interpolation can be made from any table of lettered Room Indexes and a fairly accurate Coefficient of Utilization selected.

Efficiency of Luminaire . . . General purpose tables of Coefficients of Utilization are based upon standardized luminaire types. Each has a specific efficiency, subdivided into upward and downward lumens.

The selected coefficient is correct only for a real luminaire having the same efficiency and same upward and downward distribution of lumens. If the luminaire which the designer proposes to use has a different distribution of lumens, then corrections must be made in the Coefficient of Utilization. There is not space here to go into the various steps to be taken. They are well developed elsewhere.[1,2]

Reflectances of Interior Surfaces . . . Coefficient of Utilization are usually presented in tabular form for a range of reflectances of walls and ceilings. These reflectances are the weighted averages, taking into account the effect of windows, doors, chalkboards, and so forth. Once a weighted average has been calculated, it may be necessary to apply corrections to the coefficients selected from the tables. For example, most tables do not show ceiling reflectances in excess of 75%, or wall reflectances over 50%. The current trend toward higher reflectances of all room surfaces presents the designer with ceilings of 80% to 85% reflectance and walls of 55% to 60% reflectance, weighted averages.

Examination of the original Harrison-Anderson data reveals that the effects of reflectances on the Coefficients of Utilization are approximately straight line relationships. The degree of influence depends upon the type of lighting. With indirect lighting, for example, the coefficient can be modified by the same percentage as the change in ceiling reflectance. A 10% change in ceiling reflectance will change the coefficient by 10%. With general-diffuse or direct-indirect lighting the effect of change in ceiling reflectance is about one half that for indirect lighting. In other words, a 10% increase in ceiling reflectance will increase the coefficient of utilization by about 5%. The effect of change in wall reflectance is much less marked but cannot be ignored in careful computations.

The experimental rooms in which the original data were taken had a floor reflectance of 14%. Today average floor reflectances of 20% to 25% are common. Such a reflectance will increase the Coefficient of Utilization by about 2%.

Test Plate Error . . . Measurements in the test room on which the original Harrison-Anderson tables were based were made with a Weber photometer and a test plate. A comment in the original paper states that the test plates used gave a result several percent lower than the true value due to imperfect diffusion of the plate surface. So far as the writers can learn, no correction of the original data from which Coefficients of Utilization are still calculated has ever been made. A study of the original paper indicates that in a medium sized room with indirect lighting and high reflectances throughout, the coefficients given in the IES Handbook table may legitimately be increased by about 7%. It should be noted that modern cosine-corrected light measuring instruments will respond to light at wide angles, and that the difference between calculated and measured values will, therefore, be an actual one.

Socket Voltage . . . Calculations by the lumen method involve the rated lumen output of the light source at rated voltage. The output varies with the voltage at which the lamp is operated; a change of 2 volts will change the light output by about 5%. A difference between rated lamp voltage and socket voltage of 2 volts is generally the least ever encountered, and in many cases the difference exceeds this value.

None of the corrections enumerated above are of great significance in themselves, but the effect of most of them is to increase the value of the calculated illumination. Their accumulated effect is considerable as will be shown by an actual example.

Lighting measurements were carried out over a period of time in the school classroom shown in the picture. Essential data were as follows:

Room Dimensions: 29 ft 6 in. x 12 ft 8 in.; 11 ft 6 in. ceiling.

Reflectances: Ceiling .80; plaster walls .60; floor .18; desks .44; tackboards .62; window curtains .40; woodwork .48; chalkboards .60.

Weighted Reflectances: Ceiling .80; walls .55; floor and desks .22.

Luminaires: 6 500-watt, 120-volt silvered-bowl lamps in ring fixtures. Efficiency 84%.

Lamp Voltage: 120.

Socket Voltage: 118.

Using the IES Handbook (first edition) tables without any corrections, as is the usual procedure, the Room Index is E; the Coefficient of Utilization for indirect silvered bowl lamp is .33; the calculated average initial illumination is 30.6 ft-c, and the in-

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* From the second edition IES Lighting Handbook.
Indirect and Semi-indirect Luminaires

$$RI = \frac{3\,W\,L}{2\,H\,(W + L)}$$

Direct and General Diffuse Luminaires

$$RI = \frac{W\,L}{H\,(W + L)}$$

Where W and L are room dimensions and H is height of ceiling or of luminaires above work plane.

[1] IES Lighting Handbook.
[2] Sharp, H. M., "An Introduction to Lighting"—Prentice-Hall, New York, 1951.

service value for "Medium" maintenance conditions is 19.9 ft-c.

Actual measurements were made in this room with a cosine-corrected, color-corrected light meter. Reflectances were taken with a modified Taylor reflectometer. Illumination values were found as indicated in Fig. 1. Average values figured from these measurements by the IES standard method were as follows:

As found 10 months after installation. . . .42 ft-c

As found 19 months after installation. . . .31.5 ft-c

With new lamps, 20 months after installation. . . .42 ft-c

These values should be compared with the calculated values of 30.6 ft-c initial and 19.9 ft-c estimated in service. These calculated values would be still further reduced by 5% if the correction for 118 volts socket voltage were applied.

If the selected Coefficient of Utilization of .33 is corrected in accordance with the various factors previously discussed the result is:

Corrected CU = CU from Handbook (.33) × Corr for Efficiency (.84/.85) × Corr for Ceiling RF (.80/.75) × Corr for Wall RF (1.02) × Corr for Floor RF(1.02) × Corr for Test Plate (1.07) = .39, an increase in the Coefficient of Utilization of 18% above the Handbook value. (Table 8-2).

An even greater increase is encountered when the coefficient for the specific luminaire used in this installation is calculated directly from the Harrison-Anderson tables. In this case the coefficient is .43 or 30% above the Handbook value. By calculation, the initial intensity, corrected for a loss of 2 volts at the socket, is 38 ft-c from the Harrison-Anderson data and 29 from the Handbook tables.

This inaccuracy in design introduces a severe economic waste. Instead of calling for 4500 watts to get an anticipated 30 ft-c in service in this classroom, the installation of 3450 watts would accomplish the same result. It is realized, of course, that such an exact figure cannot be realized with standard lamps. However, it does point up in a practical way, the effect of the inaccuracies so prevalent in our standard design methods.

To achieve the 30 ft-c in service as recommended by the ASA School Lighting Practice, six 750-watt filament lamps are indicated for this classroom if the published Coefficients of Utilization are used. This electrical load is a considerable factor in deciding against the use of incandescent lamps for the lighting of classrooms. As indicated by actual measurement, the ASA Practice can be met by using six 500-watt filament lamps. This might simplify the lighting question and save money in many instances.

No measurement of initial footcandles was made in the classroom cited. However, it would, of necessity, have been in excess of the 42 ft-c found with new lamps after 20 months of room use. It is evident that errors of some magnitude are still undiscovered. Perhaps a recheck of the Harrison-Anderson data is indicated, using highly accurate barrier cell measuring devices. Flux distribution in the upward zone is considerably changed with modern lamps and luminaires over that used in the original lighting calculation data.

Seattle Relights Streets to Prevent Accidents

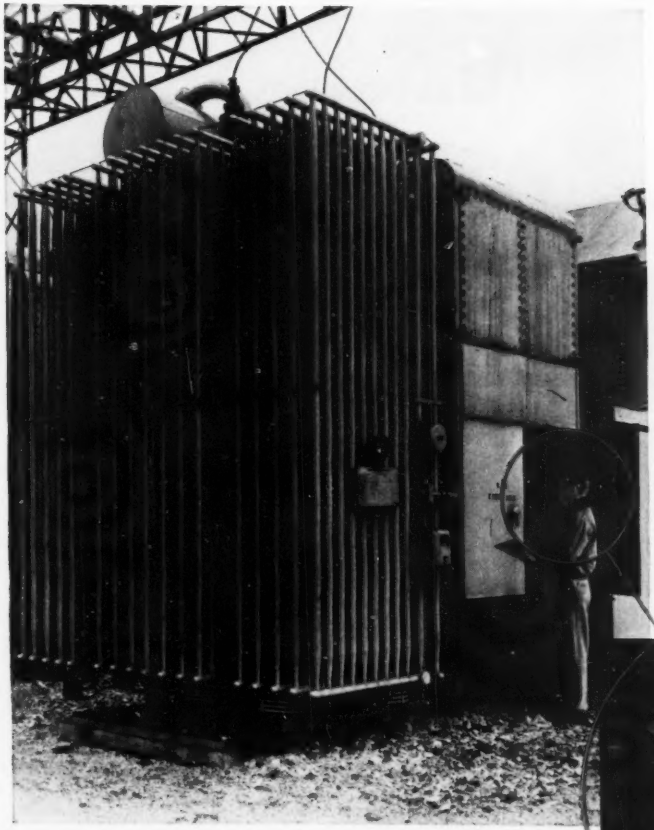
Proof that the relighting of city streets by Seattle City Light has prevented accidents is found in the night-to-day accident ratios taken before and after new lighting was installed. Studies made on the first 6.83 miles of streets for 16 months before and after installation show that the night-to-day accident ratio was 0.58 before and 0.47 after. The night-to-day injury ratio decreased even more: 1.14, before; 0.89, after.

The actual figures show that while daytime accidents increased from 496 to 679, with injuries going from 43 to 53 during the 32 month period, nighttime accidents only increased from 288 to 320, while injuries decreased from 49 to 48.

Seattle City Light's program to erect new lights on every street with an arterial stop sign will mean the relighting of 333.4 miles of streets at a cost of $4 million. Thus far, 100 miles of streets have been relighted.

In determining which streets to light first, city engineers first considered the traffic accident rates on the various streets, then the volume of traffic, and then the crime rate. Horizontal mercury vapor luminaires with 20,000-lm mercury vapor lamps were decided upon with a Type 2 pattern luminaire used on streets up to 32 ft wide, Type 4 on streets up to 76 ft wide. Luminaires are mounted at a height of 30 ft and spaced from 90 to 150 ft apart, depending upon traffic density and street width. Nearly 90% of the lights are mounted on existing wooden utility poles and served by overhead wiring. The remaining units are mounted on new steel poles with underground wiring.

NEW LUMINAIRES light the way along Aurora Ave, Seattle's most heavily travelled traffic artery. Steel poles and underground wiring were used on this job



General Electric transformer rated 6000/7500 kva, 33-kv, installed on Indianapolis Power & Light System. Load-ratio control in low-voltage winding provides ±5% voltage regulation.

Prediction: 14 years of tap changes without any servicing

This particular G-E transformer will operate 14 years at its current rate of 20 tap changes a day before its load-ratio-control equipment requires servicing. This means that for 14 years the maintenance crew will not have to clean insulating surfaces or filter the contactor oil! In fact, the contactor compartment need not be opened during this entire period.

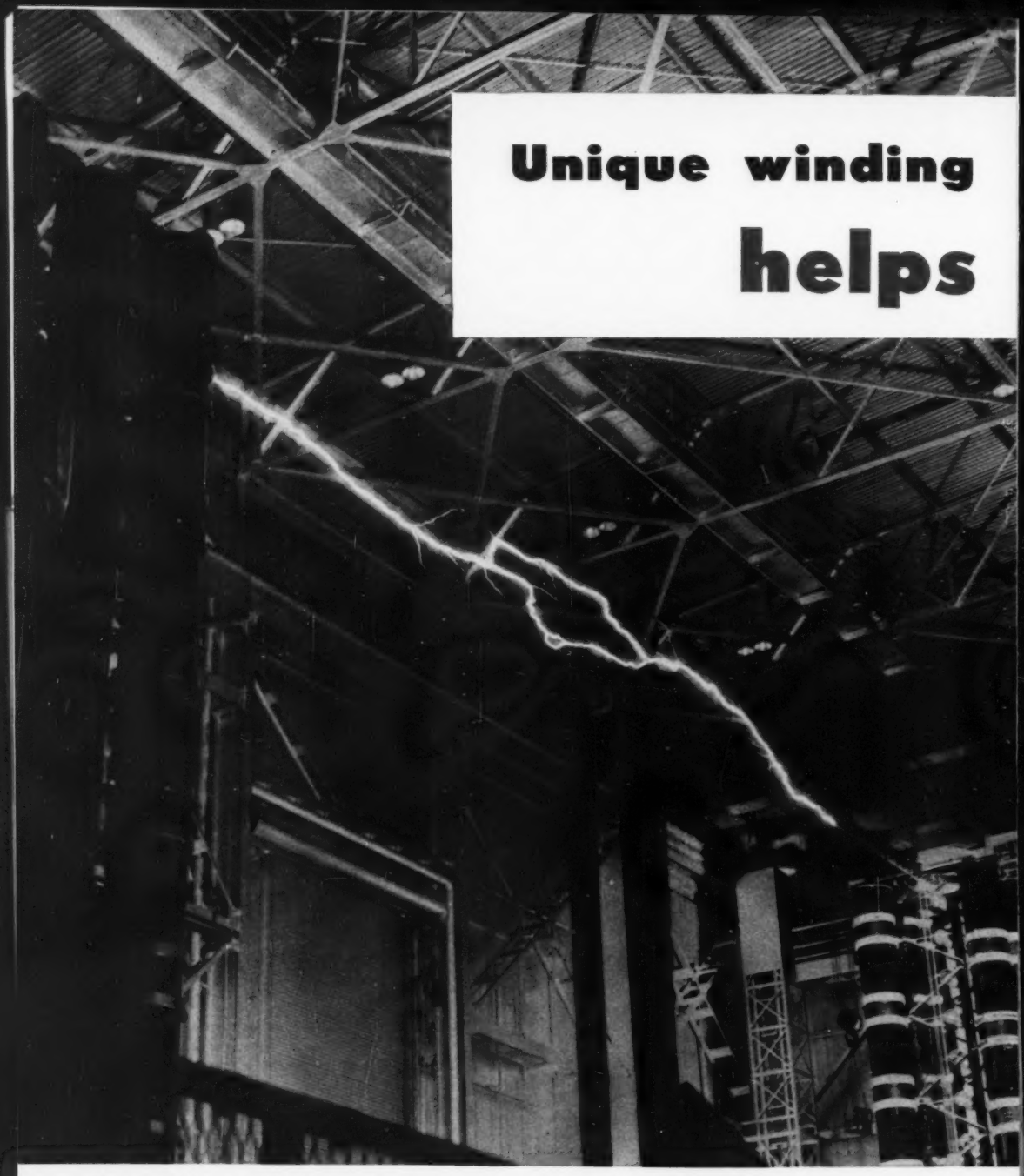
The really significant point, however, is this: We can tell you—and do tell you for each transformer—how many operations the LRC equipment will make before any servicing is required. We have tested the contacts of each design until we know, accurately, the life of the arcing tips. By the use of electrostatic shielding, and by having a major portion of creepage distances in the vertical plane, we prevent dangerous deposits of carbon from forming on insulating surfaces during this period.

In other words, with G-E load-ratio-control equipment, you don't do any *unnecessary* service work. You simply refer to the instruction book and read the counter to predict the time that servicing is actually required.

Over 37,000,000 installed kva have proved that General Electric LRC is as reliable as the core and coils themselves. Call on your G-E representative for a complete discussion on the LRC transformer best suited to your application. *General Electric Co., Schenectady 5, N. Y.*

401-18

GENERAL ELECTRIC



Unique winding helps

A story without an end. Here, in our new High Voltage Engineering Laboratory, is man-made lightning—a 15,000,000-volt surge—a spectacular example of the research tools General Electric provides its team of transformer engineers and scientists. As a result of studies made here, shielded windings and the balanced, two-section coil were developed to distribute surge voltages more uniformly throughout the coil.

This unbeatable G-E combination of brains, plus the finest equipment, helped develop Spirakore's many outstanding advantages. Besides progressive layer insulation, there's our special paint (Melaglyp†) that increases weather durability by 50 per cent, and air-tight sealing that prolongs oil and transformer life.

Yes, in *all* respects Spirakore leads the field. And with continuing G-E research, Spirakore will *always* be the standard for others to try to equal.

†A new, greatly improved G-E paint made with melamine-modified Glyptal (registered trademark of the General Electric Co. for alkyd resin).

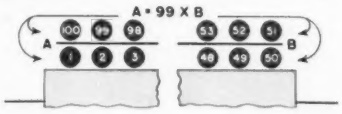
SPIRAKORE TRANSFORMERS

method...

lick lightning

Lightning used to spell death for numerous high-voltage distribution transformers every year. Yet since the early '40's, such failures have been almost non-existent where Spirakore high-voltage transformers were used.

Reason? Progressive layer insulation is one of the reasons. This unique winding method provides the greatest strength where the stress is greatest, thus compensating for the difference in layer-to-layer voltage stress—both normal and impulse—that occurs from one end of the coil to the other.

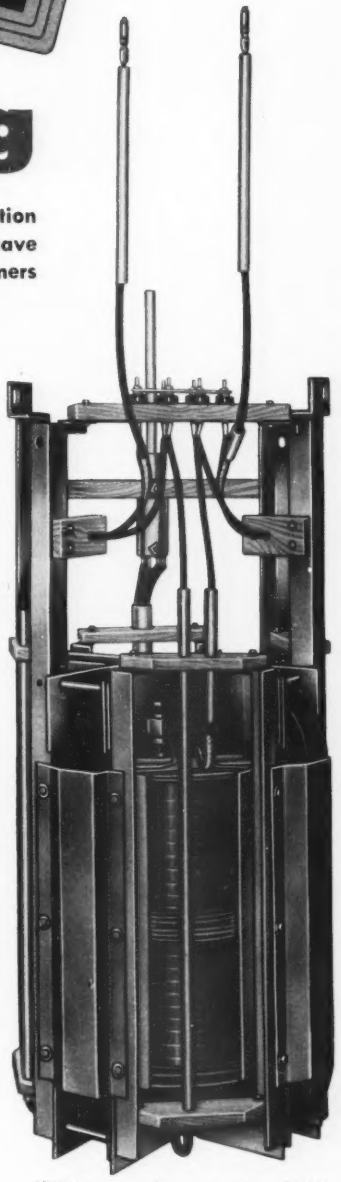


For example, if each layer of windings consists of 50 turns, the 100th turn falls directly over the 1st turn. (See diagram.) Consequently, the voltage stress at this point (A) is 99 times greater than at the opposite end of the winding (B). And at the moment of a high impulse through a high-voltage transformer, these layer-to-layer stresses may vary by as much as 5,000 volts.

Progressive layer insulation helps lick this problem by keeping the insulating strength proportional to the stresses. This is done by winding a *full layer width* of paper dielectric into the coil along with each turn of the conductor. Hence, as turns are added, the layers of paper increase and keep the insulation proportional to the voltage stress—both normal and impulse. And the multiple thicknesses of insulation provide higher dielectric strength than a single sheet of the same total thickness.

Consequently, you get that *extra stamina* that keeps Spirakore transformers always on the job. Check your records over the past ten years—you'll see how thoroughly Spirakore has licked the lightning problem. *General Electric Company, Schenectady 5, N. Y.*

*Registered trademark of the General Electric Co.



All Spirakore transformers, rated over 15,000 volts, have progressive layer insulation.

GENERAL ELECTRIC

402-113

The controls on all station-type feeder voltage regulators now meet rigid ASA Standards for Class I accuracy. This means they have an accuracy of at least 99%.

Induction Voltage Regulators require less maintenance

- No contacts in the main circuit
- No cams or springs or elaborate gear trains
- No mechanical brake to adjust, no separate braking circuit
- Nothing to lubricate—complete operating mechanism (including the motor) immersed in oil
- Even the oil lasts longer—because the tank is sealed to stop all breathing

The General Electric IRS Induction Voltage Regulator has only three shafts, including that of the motor. All are mounted on enduring roller or ball bearings; all operate under oil. Wear is negligible. One gear train, a double-worm reduction, provides a drive that is simple, silent, self-locking and positive. There are no ratchets, no pawls, no chains to introduce uncertain operation and questionable life. No special braking circuits are used. The capacitor that gives the motor its high starting torque promptly throttles its rotation when the motor supply circuit is opened.

And remember—G-E induction voltage regulators give accurate, stepless regulation of the highest quality obtainable. Rugged simplicity and the absence of time-delay makes them ideally suited for use on distribution circuits where loads are heavy, voltage variations are frequent, and prompt response to voltage change is essential.

Bulletin GEA-2985 gives full information. A copy can be secured from your G-E Apparatus Sales Office, or by writing *General Electric Company, Schenectady 5, N. Y.*

404-79

GENERAL ELECTRIC

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

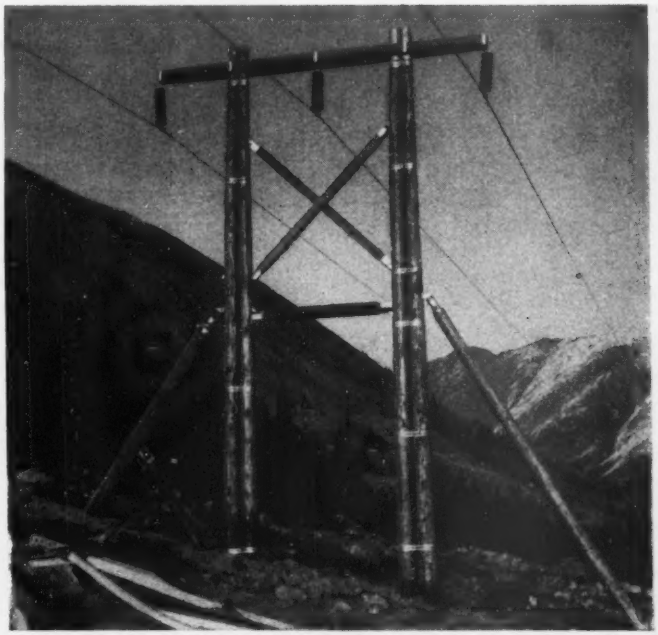
Double H-Frame Solves Snow Problem

L. M. ROBERTSON
Asst Supt Transmission and Distribution
Public Service Co of Colorado

Winter maintenance of transmission line towers in mountainous regions is more successful with reinforced wood pole tower construction than with steel towers, even protected by snow barriers. Public Service of Colorado has had excellent experience at high altitudes with a new double H-frame design of wood poles reinforced by side poles and X-braces. This design allows snow to pass by the structure without harm to the tower. Placing the poles parallel to the path of the slides tends to divert the snow or let it flow around them.

Conventional steel towers have the effect of blocking the snow and especially of catching debris borne along with the slide. Past attempts to protect heavy towers by placing steel members in a V-shape above them in the path of the projected slides have not been satisfactory. They are initially successful in diverting the first slide in the season, but snow is left piled around them so that succeeding slides during the winter go over the barrier and damage the tower.

When the company's Shoshone-Denver 115-kv transmission line was built 45 years ago, steel towers were used. Frequency of snow slides during the winter months in the high mountain country over the Continental Divide has resulted in many towers destroyed by slides with consequent power interruption and expensive repairs. Experience with the wood pole type of construction indicates that the problem may now be solved.



REINFORCED WOOD POLE TOWER braced by side poles and X-braces withstands heavy snow slides in mountain territory. Steel tower in foreground has been destroyed by slides, path of which can be seen around base of wood tower parallel to it

Re-fuse Branch Lines With Hot Stick Device

G. H. BROYLES
District Distribution Engineer
Appalachian Electric Power Co
Roanoke, Va.

A hot-stick fuse-puller has been devised which permits a man on the ground to safely re-fuse branch-line transformers. If the new fuse should blow, the serviceman will be in the clear. The specific branch line will be isolated so the trouble may be located and remedied with the least line patrolling.

A fuse puller is attached to one end of a hot-stick, the other end of which has a tree-trimmer coupling to permit extension with additional hot-sticks. Two- or three-section hot-sticks will serve for most applications.

Heretofore, whenever trouble occurred on branch lines, troublemen had to climb poles to replace fuses, close oil switches, etc. Now by using this hot-stick fuse-puller, and with only a small amount of practice, troublemen can remain on the ground and take full advantage of these three benefits:

1. Safety—They remain at safe dis-

A new 500-kva, General Electric network unit is lowered into its vault on North Pennsylvania Street, Indianapolis by an Indianapolis Power & Light Company crew.

Load grows in Indianapolis
...and a new G-E Network Unit goes in

It's as simple as that with a secondary network. There is little rearrangement of secondaries or service entrances with this modern distribution system.

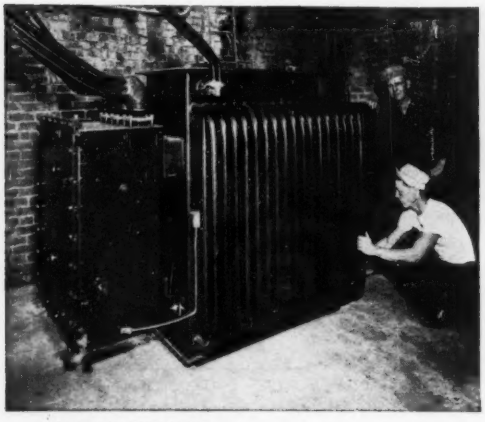
Better continuity of service is one big advantage of a secondary network. But, equally important to the utility is the elimination of headaches—and saving of rearrangement costs—as loads grow. Once a network system is installed, load growth can be taken care of by adding network units—*with seldom any other change or rearrangement required.*

This has been demonstrated in every city having such a system. Take Indianapolis, for example: Load increased greatly in the area around the post office on North Pennsylvania Street—modernization of stores, a new bank, and in general a healthy expansion of this business section.

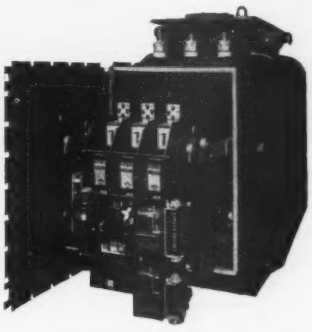
To serve this new load, the Indianapolis Power & Light Co. built a new vault and installed one 500-kva General Electric network unit.

The high-voltage feeder was already in the area—operating at 13,200 volts, it had plenty of capacity for the new load. The secondary was already in place . . . and with an established network system, the new unit was connected to this feeder and tapped in to reinforce the existing secondary grid. No redistribution of load was required, no rearrangement of service drops from one bank to another.

In every respect, with a network system, each added transformer represents an orderly step in system growth that was all provided for when the network was first engineered. For more information write for GEA-5024 and GEA-2017, *General Electric Company, Schenectady 5, New York.*



IN PLACE IN THE VAULT. This is the same unit shown on the opposite page after it was placed in the vault, and after cable connections were made. To the left is the throat-mounted General Electric network protector; at the right is the three-position disconnecting and grounding switch on the high-voltage side of the transformer.



G-E NETWORK PROTECTORS ARE EASY TO INSPECT . . . EASY TO MAINTAIN. Automatic system protection on a network transformer is provided by the network protector which trips on reversal of power. When conditions are corrected, it recloses automatically. Protector case is submersible. With the door open, the protector unit can be slid out on rails for ready inspection. Dust-tight relays are of the plug-in type—can be easily removed for checking and replaced with spares.

GENERAL ELECTRIC

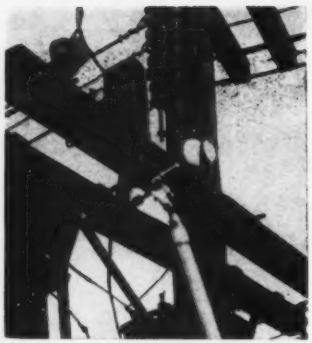
402-112

tance from hot lines and open fuse holders.

2. Save Time—They do not have to ascend and descend poles. Time spent putting on and taking off climbing equipment is saved.

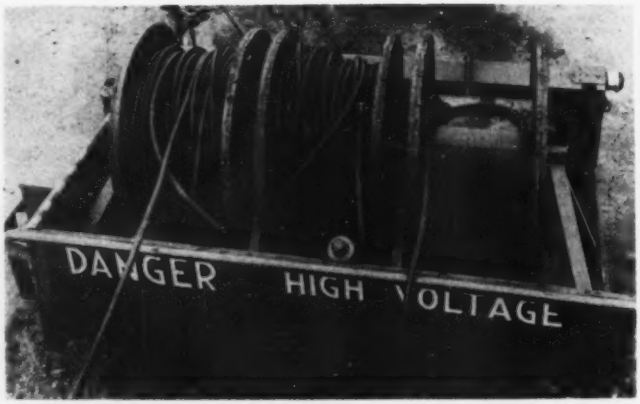
3. Versatility—They can re-fuse transformers on 30- to 35-ft poles; operate fuses or pole-mounted oil circuit reclosers; remove and replace two-shot cutout box lids; and separate wrapped wires without the necessity of having to climb a ladder.

Since this stick was put in use several years ago, it has become standard equipment on all trouble trucks, and has been used by troublemen constantly.



FUSE-PULLER for hot-stick permits lineman to remove fuse safely while standing on the ground away from the holder

Trailer Speeds Service Restoration



CABLE REELS which unwind simultaneously in both directions help to restore service quickly on faulted primaries. Each reel revolves independently

H. L. SWICEGOOD
Asst Distribution Supt
Brockton Edison Co
Brockton, Mass.

Service is restored quickly on primary feeders through use of a cable trailer carrying three reels which can be unwound simultaneously in both directions. The trailer consists of a pole dinky and a pick-up truck body. Three standard 30 in. reels revolve independently on a shaft supported at the ends and between the reels. The ends of the shaft are braced to prevent movement of the reels while the trailer is in motion.

On each reel is 350 ft of No. 2 stranded conductor with 5-kv insulation. This length of cable will span two normal stretches. On one end of each cable is a jumper clamp and on the other a load pick-up jumper clamp.

The trailer is equipped with night lights operated by storage battery. In addition, flares are carried to protect the trailer when parked along the roadside after dark.

The cable trailer also has been used during removal of large trees along primary lines, to eliminate the dangerous and costly practice of topping the trees above the wires. The load is shunted through cables laid on the ground and the line primaries are taken down. The tree is then removed and permanent primaries replaced and the cable is rewound on the reels.

Check Frequency Meters Accurately at Low Cost

JOHN F. PHELAN
Chief Load Dispatcher
Indiana & Michigan Electric Co
South Bend, Indiana

A simple inexpensive method of checking frequency-recorder 60-cycle calibration accurately and quickly was devised and applied at Twin Branch Plant. This station has a time (frequency) standard actuated by a highly developed crystal-controlled 60-cycle power source. The checking method will be evident when it is recalled that the Leeds-Northrup system frequency time-error indicator has a differential-gear device, one side of which is driven by the system frequency and the other side by the highly accurate 60-cycle standard source. When both frequencies are identical, the differential idling gear stands still and the system recorder should read 60 cycles.

To give the operating personnel a visual indication when the system frequency is precisely 60 cycles, the South Bend meter department mounted a small pen-type flashlight bulb on a suitable holder so that the image of the frequency-error gear was projected onto a ground-glass window in the face of the L-N instrument. The enlarged images of the gear teeth clearly indicate when the system frequency and standard 60-cycle frequency are identical. This equipment was recently moved to the System Dispatching Office at Fort Wayne.

The total cost of the frequency-checking device was approximately $25. Its application is limited to control having suitable time standard.

Aluminum Production and Electrical Energy Used In North America Peak War Year—1943

	United States	Canada	North America
Aluminum Production			
Metric tons (1,000)	835	450	1,285
Electrical Production			
Energy used* (billion kwhr)	18.4	9.9	28.3
Annual Energy Output			
Hydro (billion kwhr)	79.1	39.6	118.7
Total (billion kwhr)	267.5	40.5	308
Energy Used to Produce Aluminum*			
Percent of hydro	23.3	25	23.8
Percent of total	6.9	24.4	9.2

Source: "Aluminum, The Industry and the Four North American Producers," courtesy The First Boston Corp.

* About 10 kwhr are required to produce 1 lb of aluminum.

"GENEVA ACTION"

Indicating Demand Register

low reset load on motor

long motor life

positive reset by Geneva action — no shock

minimum number of parts

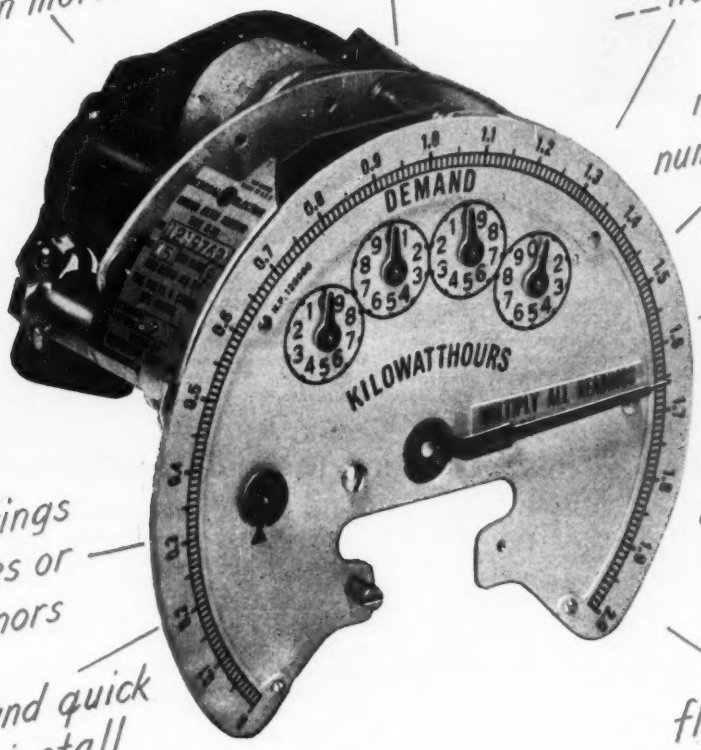
long scale 9½ inches

simple adjustments

maximum flexibility in demand measurements

easy and quick to install

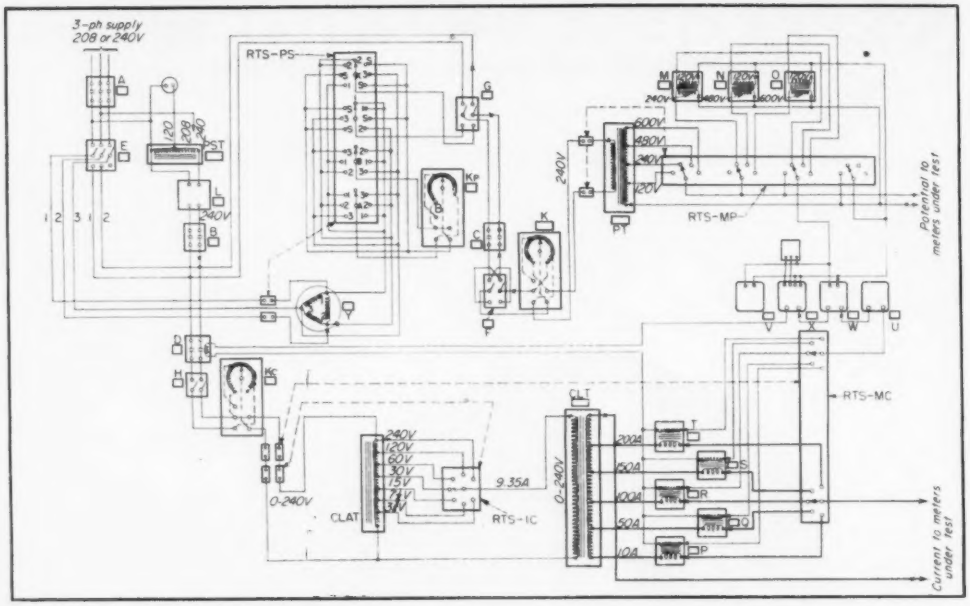
no springs latches or governors



TYPE M-30 INDICATING DEMAND REGISTERS may be installed on standard General Electric watthour meters. Type M-31 cumulative demand register is also available. For more information, contact your nearest G-E representative or write for M-30 bulletin GEC-413 or for M-31 bulletin GEC-272. General Electric Company, Schenectady, N. Y.

601-51

GENERAL ELECTRIC



POWER-SUPPLY TEST UNIT for 60-cycle thermal demand meters. A, B, C, D=circuit breaker. E, F, G, H=switch. K, K_c, K_p=variable autotransformer (K_p is connected in succession across pairs of terminals of phase converter to shift phase of output voltage by small increments). L=constant voltage transformer. M, N, O=meter potential transformer. P, Q, R, S, T=current transformer. U=ammeter, 0-5 amp. V=voltmeter, 0-150 v. W=wattmeter, 1-phase, 0-600 w. X=power factor meter, 1-phase. Y=motor, 1 hp, 3 phase. 3 wire 220 v (used as induction generator phase converter; 1-ph input, 3-ph output). RTS=rotary tap switch: PS, phase shifter; MP, meter potential; IC, increase current; MC, maximum current. CLT, CLAT=current loading transformer and autotransformer. PT, PST=potential and power transformer

Power Supply Unit for Testing Thermal Demand Meters

A test unit has been designed to meet the basic requirements for testing thermal demand meters, namely: 1) an adjustable source of steady voltage; 2) an adjustable source of steady current; 3) a phase shifter by means of which the phase angle between voltage and current (power factor of the circuit) can be adjusted to any value, lagging or leading, and held constant. This unit is a development of the Eastern Specialty Co, Philadelphia, Pa.

Thermal demand meters as they are currently manufactured are rated at 120, 240, 480, or 600 v. Nominal or name-plate current ratings are 2.5, 5, 15, or 50 amp. Full scale deflection of a thermal meter is usually obtained on an overload basis according to the accompanying general table:

Nominal Rating, Amperes	Amperes for Full Scale Deflection
2.5	8-1/3
5	8-1/3
15	41-2/3 or 50
50	100, 150 or 200

Indicating instruments on the test panel consist of voltmeter, ammeter, wattmeter, and power factor meter. All tests are made on single-phase. The panel instruments operate at 120 v on all voltage ranges, and at 5 amp on all current ranges, by means of standard metering transformers.

Three variable autotransformers (K_p, K_c, K) provide close control for voltage, current, and power factor. All sections of the testing circuit are protected by overload circuit breakers of the panel reset type.

Steady 3-Phase Power Source

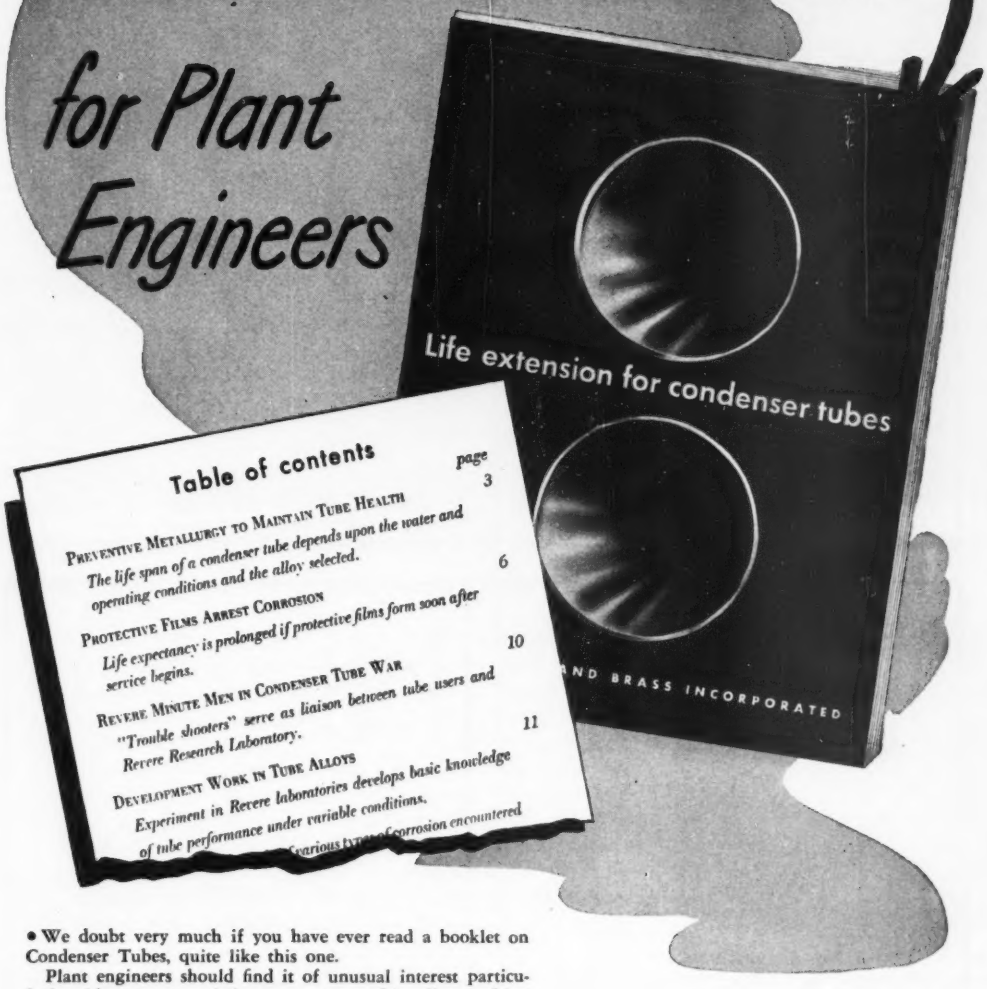
To provide a stable and steady source of 3-phase voltage for the testing circuit, one phase of the power supply goes through a built-in voltage regulator (L) which removes the line voltage fluctuations. The resultant steady single-phase voltage is then changed by means of a rotary induction phase converter (Y) into stable 3-phase power and used to operate the phase shifting variable autotransformers (K_p). With a constant burden, the voltages and phase angles of the converter remain steady, and are stated to be immune to line voltage fluctuations.

The power takeoff is from binding posts on one side of the unit, from which cables can be run to the customer's meter test rack.

Capacity of the test board is about 500 va on the potential circuit and 1,000 va on the current circuit. This is sufficient to test from 50 to 100 meters.

Because the test board furnishes regulated voltage, current, and power factor, it may be used for testing other devices. For example, the board can be used for an overnight gang test of watthour meters when checking register ratios. Also it could be used for testing network relays or other devices where phase angle is of importance.

"MUST" Reading for Plant Engineers


Life extension for condenser tubes
Table of contents page
PREVENTIVE METALLURGY TO MAINTAIN TUBE HEALTH 3
The life span of a condenser tube depends upon the water and operating conditions and the alloy selected.
PROTECTIVE FILMS ARREST CORROSION 6
Life expectancy is prolonged if protective films form soon after service begins.
REVERE MINUTE MEN IN CONDENSER TUBE WAR 10
"Trouble shooters" serve as liaison between tube users and Revere Research Laboratory.
DEVELOPMENT WORK IN TUBE ALLOYS 11
Experiment in Revere laboratories develops basic knowledge of tube performance under variable conditions.
various types of corrosion encountered
ND BRASS INCORPORATED

• We doubt very much if you have ever read a booklet on Condenser Tubes, quite like this one.

Plant engineers should find it of unusual interest particularly with present restrictions on copper and its alloys making it more important than ever that every last ounce of use be squeezed out of the condenser tubes in their plants.

This 28-page booklet includes data on various copper alloys, photos of cut-away tube sections showing various types of corrosion encountered in condenser tube service and photomicrographs showing the grain structure of different kinds of metals under varying operating conditions.

Send for your copy today. Please make request on your firm's letterhead. Thank you. Address Department E.W., Revere Copper and Brass Incorporated, 250 Park Avenue, N. Y. 17, N. Y.

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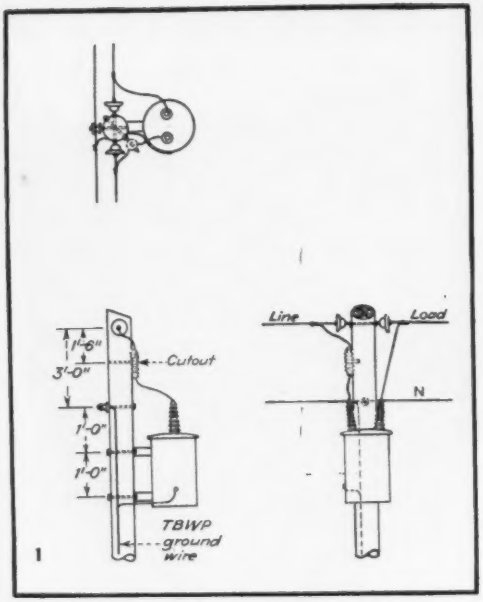
SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

A Guide to Pole Mounting of Reclosers

7.2-kv, Single and Three-phase

An adaptation from
construction standards of
Wisconsin Power & Light Co



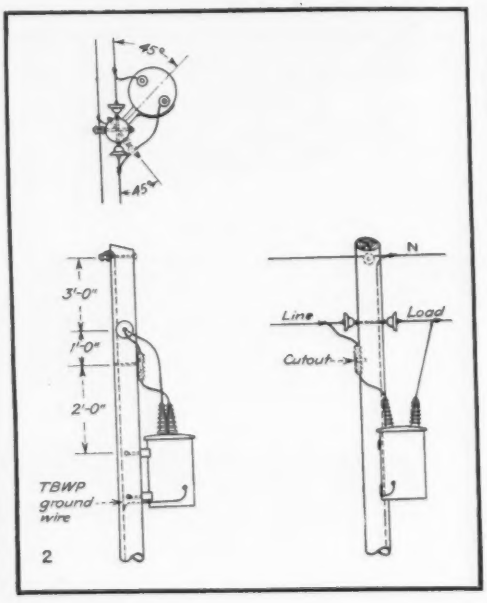
1—SINGLE-PHASE RECLOSER arrangement when phase line is at top of pole

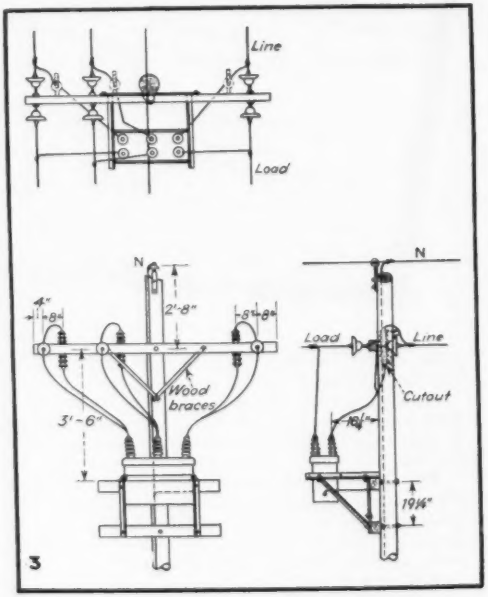
2—SINGLE-PHASE RECLOSER arrangement when neutral line is at top of pole

3—THREE-PHASE RECLOSER arrangement when neutral line is carried on ridge pin

NOTES:

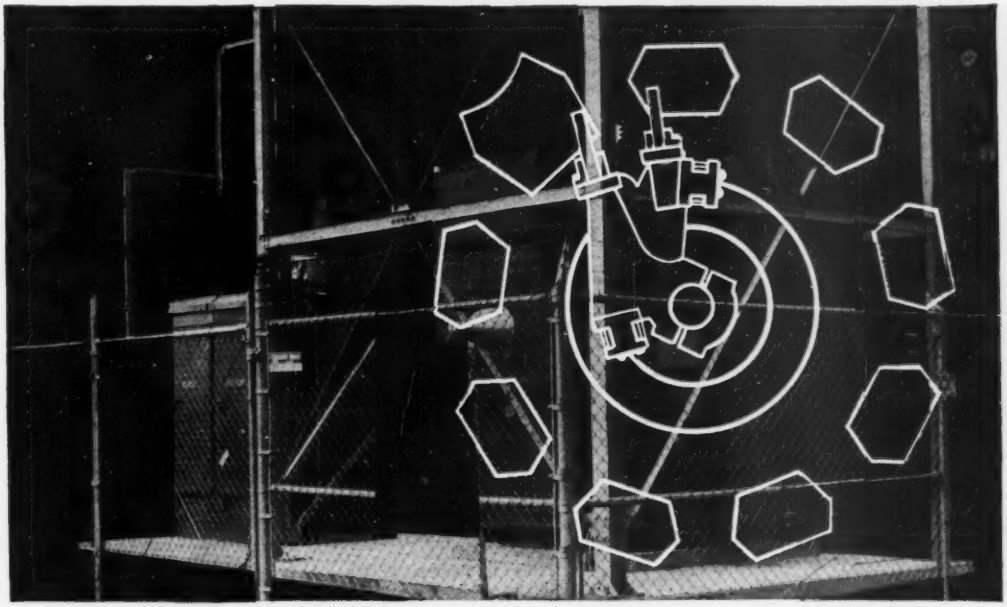
A. *Locate recloser one span from the take-off pole.* (**Fig. 1 and 2**)
B. *Do not locate recloser on junction pole.* (**Fig. 3**)
C. *Optional—7.5 kv cutout with solid blade.* (**Fig. 1, 2 and 3**)





ELIMINATE ALL ARCING

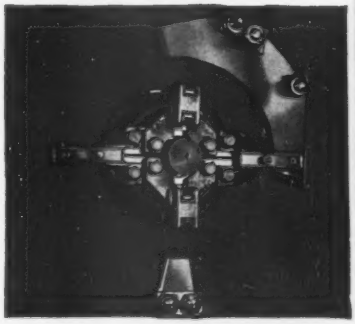
ON TAP SELECTOR SWITCH CONTACTS WITH . . .



. . . MOLONEY LOAD TAP CHANGERS PROVIDED ON FEEDER VOLTAGE REGULATORS, REGULATING TRANSFORMERS, LOAD RATIO CONTROL TRANSFORMERS

All Moloney Feeder Voltage Regulators, Regulating Transformers and Load Ratio Control Transformers are provided with Load Tap Changers which feature a load transfer switch to relieve the tap selector switch of all arcing duties. The load transfer switch has only four stationary contact tips per phase as compared with eighteen on the tap selector switch. This arrangement not only reduces the number of contacts subject to arc erosion, but also permits longer arc clearances to assure positive break of the arc. Liberal clearances of current carrying parts result in maximum capacity of the regulating equipment with minimum physical size. The load transfer switch, which is the only switch required tc transfer load current, is provided with accelerating springs and is driven by Geneva gears. This assures quick break of the arc.

This is but one of the many features of the Moloney Load Tap Changer. This same sound basic construction is found in the regulating apparatus on which the tap changer is used.



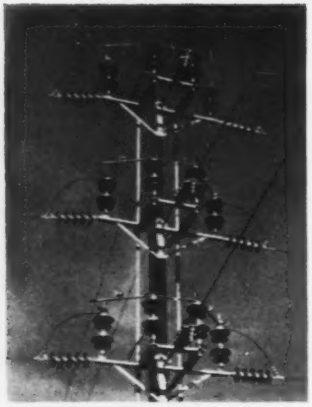
Liberal clearances prevent establishment of an arc between adjacent current carrying contacts of the load transfer switch. Special alloy arcing tips prevent damage to the switch contacts as they are opened or closed.

MEBI-10

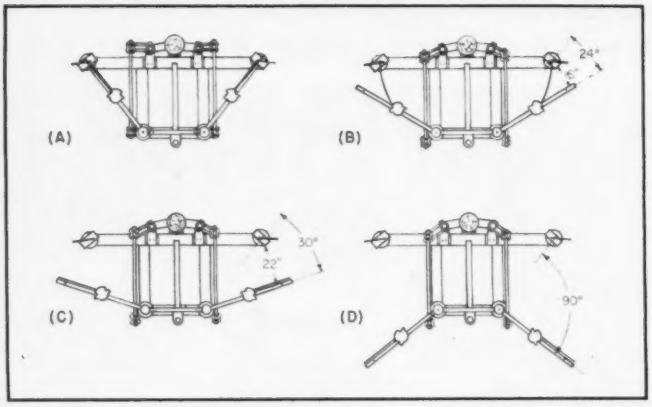
MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA



NEW AIR BREAK switch mounts phases vertically with 9 ft separation. Unit is made in two frame sizes, one suitable for 15- or 23-kv rating; the other for voltage ratings of 34.5, 46 or 69 kv



QUICK-BREAK ACTION of new air break switch is illustrated in this sequence. (A) Switch is in closed position. (B) Blade has opened 24 deg, compressing arcing horn spring which still maintains contact against arcing horn. (C) During 6 deg more of blade travel spring is released with a snapping action. Clearance between blade and contacts now is 22 in. (D) Switch moves to full open position

Air Break Switch Opens Line With No Restrikes

E. F. SMITH
Electrical Engineering Dept
University of Florida
Gainesville, Florida

W. G. PARMENTER
Supt. of Substations
Georgia Power & Light Co
Valdosta, Georgia

Successful openings of long transmission lines without restrikes were made during tests of a new 69-kv gang-operated air break switch by Georgia Power & Light Co on one of its 66-kv lines near Quitman, Ga. In one test, the switch, a 69KV600 Matthews GOABS, opened a 61.5 mile section of line in 4 cycles, interrupting a charging current of 15.4 amp. Results of other tests are shown in the accompanying table. These results cover all conditions and peculiarities noticed in the 13 tests.

Unique feature of the switch is a quick-break arcing horn, which maintains electrical contact until the blade has opened about 13 in. and then snaps open quickly to disrupt the arc. The quick-break on opening is obtained by a phosphor-bronze spring action arcing horn attached to a movable blade. The horn is compressed as the blade opens.

The switch consists of two horizontal opening switches per phase, with provision for a tap line take-off between the two. Phases are mounted vertically on the structure with 9 ft separation, thus allowing a complete two-way feed line sectionalizing switch installation to be made on one wood pole. (See illustration at left.)

The tests were made on a line which could be isolated in lengths of 11.9 miles; 22.8 miles; 40.3 miles; and 61.5 miles. Three tests each were made on the lengths of line from 11.9 to 40.3 miles; four tests were made on the 61.5 mile section. Line conductor was 4/0 ACSR; pole spans were about 360 ft. Equivalent spacing was 7.5 ft.

Wind velocity during the tests varied from 2 to 15 mph and was gusty. Wind velocity and relative humidity were taken before each series of switch openings. Pictures were made of voltage and current indications and of blade positions as measured on a six-element oscillograph. Three slow-motion cameras were used to record the arc behavior. A voltmeter connected in the circuit measured arc voltage as the charging current was being cleared.

Observations drawn from the tests are these:

1. Blade speed has a definite bearing on ability of switch to interrupt arcs. At 2.9 deg per cycle, interruption is quick and clean. At 2.5 and 2.6 deg per cycle, restriking occurs. At 0.6 deg per cycle, interrupting ability of the switch is lost.

2. Every restrike observed lasted only ½ cycle and was almost always in the same instantaneous direction of

(*Continued on page 150*)

How Blade Speed Governs Switch Performance Is Shown by Typical Tests

Test	Blade Speed Deg. per Cycle	Miles of Line Interrupted	Charging Current Amps (RMS)	Arcing Time Cycles	Remarks
2-C	2.5	22.8	5.1	3	One break of ½ cycle was followed by a ½ cycle restrike
3-A	2.9	40.3	10	3	No breaks or restrikes; very noticeable line discharge voltage after current zero
3-C	2.6	40.3	10	4.5	Two ½ cycle breaks and two ½ cycle restrikes just before current zero; line discharge voltage lower than in 3-A
4-A	2.9	61.5	15.4	4	No restrikes; line discharge voltage about equal to 3-A
4-C	0.6	61.5	15.4	Arc not broken	Arc grew until it went to ground

IT'S NEW!

the answer to your interrupting problems

*Available with

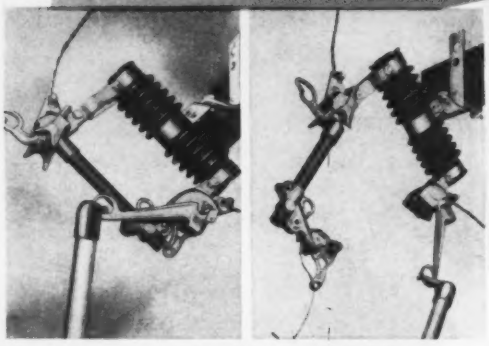
the new CHANCE Cutout ...

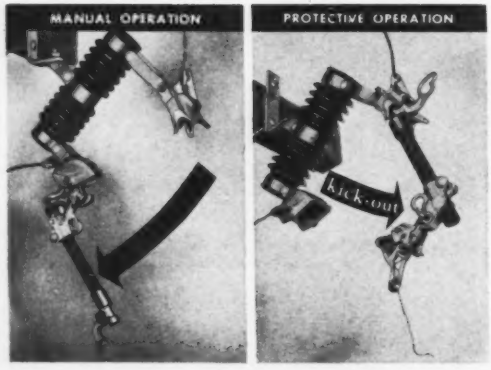
See Next Page

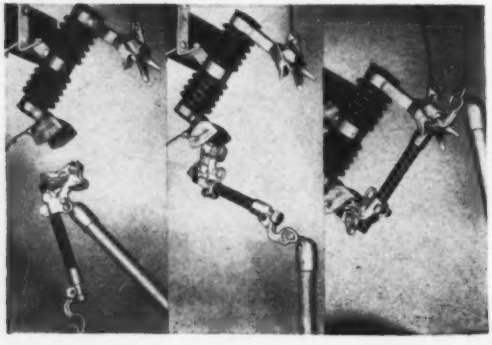
NOW...the combination you've asked for...

LOAD BREAK OPERATION *plus*

OVERALL PROTECTION...in the new CHANCE KO Cutout







C51-4

Breaks charging, magnetizing and load currents —manually

The new KO cutout is now available with a *load break* lever for interrupting line charging currents, capacitor bank circuits, loop or radial circuits and single or three phase transformer magnetizing or load currents without the aid of reclosers, circuit breakers or expensive load break equipment. By pulling the load break lever, the circuit is interrupted *inside* the fuse tube, in the same manner as when the fuse is blown by an overload or fault. Photo at left shows the simplicity of operation. The delayed Kick-Out prevents contact pitting.

Exclusive Kick-Out operation—gives you these advantages

The exclusive CHANCE "kick-out" operation gives a *positive* indication to trouble shooters that the cutout has been opened manually or by a protective operation, thus saving costly patrolling time. The Kick-Out method of operation has the advantage of mechanical time delayed separation of contacts not possible in gravity operated cutouts. Link ejection is completed and arc extinguished in tube before contacts part. This prevents pitting and burning of contacts, eliminates contact maintenance and reduces radio and television interference.

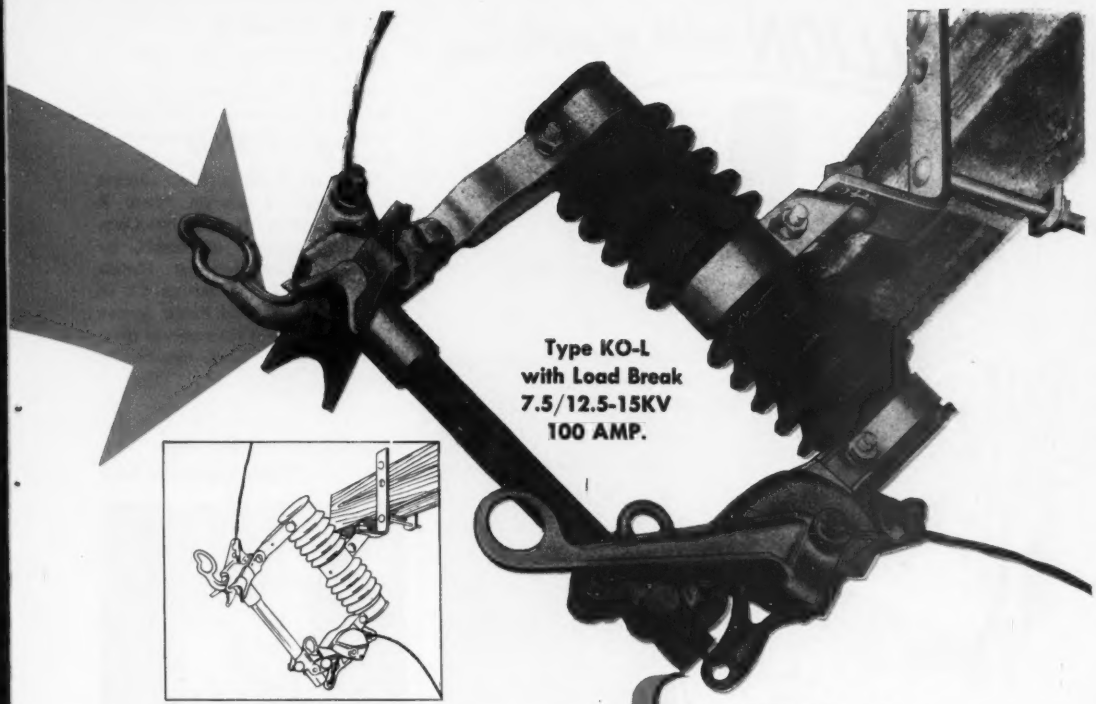
Easy to Re-Fuse with a Hook Stick

Chance KO Cutouts with or without the load break lever are easily reloaded. The tube is released by a pry-out lever. The KO design prevents any shock or strain on the fuse link when closing the cutout after re-fusing. This prevents damage or breakage of the link. Long guides aid the operator in closing the cutout from any angle. When the cutout is closed-in on a fault, expulsion gases are directed away from the operator.

Overall Protection from Light Overloads to Heavy Fault Currents

Thousands of successful field tests* prove superior performance from 1 amp to above 3500 RMS amps at power factors of less than 20%—your assurance of positive protection from light overloads to heavy fault currents.

*Tests made by Chance Mobile Lab on utility systems.



Type KO-L with Load Break 7.5/12.5-15KV 100 AMP.

Type KO (Conventional)
Same heavy construction as KO-L

Only CHANCE gives you all these features

... make your own comparison with any other cutout

Compare the Chance KO with any other cutout . . . compare it electrically—compare it mechanically—test it for high or low current operation . . . you'll find that these CHANCE features add up to economical, safe, always reliable operation.

Order through your electrical supplier—specify CHANCE—KO or KO-L.

1 ***LOAD BREAK*** **device, optional.**

2 ***Overall Protection*****—Proved by thousands of tests.**

3 ***Pry-Out Lever*** **for easy opening and closing. Allows the use of heavy duty contact springs without requiring extra effort to remove tube.**

4 ***Exclusive Ejector Mechanism*** **provides fast complete ejection of fuse link before contacts part—even on a low current interruption.**

5 ***Sleet Shields for All-weather Operation.*** **Protect contacts and operating mechanism and prevent water from entering the tube to cause twisting and swelling of the fiber.**

6 ***Mechanical Time-Delayed Contact Separation.*** **Prevents pitting or burning of contacts.**

7 ***Pivot Bracket*** **(E.E.I.—NEMA) for cross-arm mounting. A special bracket is available for pole mounting.**

8 ***Positive Semaphore Indication*** **to show if cutout was opened manually or by a protective operation.**

9 ***Easy Reloading*****—simple hook stick operation from any angle.**

10 ***Link Element Protection*****—Link tension not affected by closing action. Eliminates breakage or damage to time-current characteristics of link.**

11 ***Overtravel Stops*****—Protect pressure contact springs.**

12 ***Safety to Operator*****—Tube angle directs expulsion gases away from lineman when operating cutout.**

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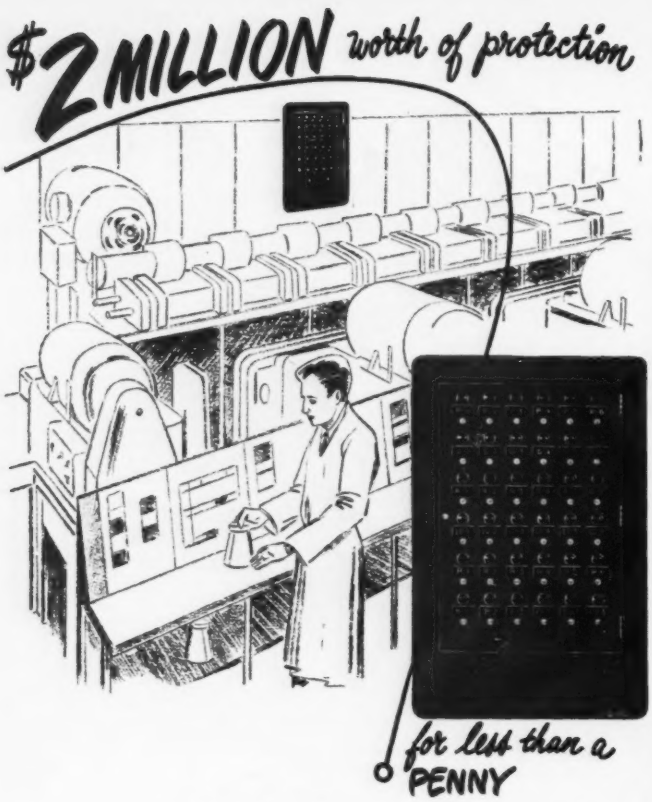

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SUPERVISORY ANNUNCIATORS

Here's how they work: when trouble occurs, a supervisory annunciator receives an electrical impulse from a normally open or normally closed, momentary or maintaining contactor, such as a thermostat, pressure or float switch. This impulse is converted in the annunciator circuit to a maintaining circuit that operates a visible signal indicating the source of trouble, and simultaneously sounds an audible alarm. Various operations sequences are available.

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MANUFACTURERS OF: Electrical Signaling, Communication and Protective Equipment for Housing, Hospitals, Schools, Offices, Ships, and Industry.

Air Break Switch

(*Continued from page* 146)

current. It seems possible that some sort of rectifier action is taking place. Further study of this phenomenon is indicated.

Observers at the tests, in addition to members of Georgia Power & Light Co, the W. N. Matthews Corp, and the University of Florida, included representatives of Florida Power Corp, Public Service Co of Northern Illinois, and Public Service Co of Indiana, and ten representatives of several rural electric membership cooperatives.

Speed Battery Salvage With Circular Saw

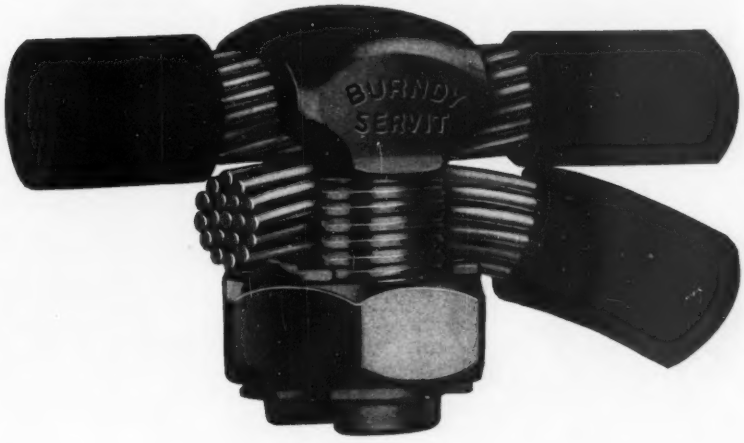
SALVAGE OF BATTERIES can be done economically by using a circular saw to cut bolts holding the individual plates

E. R. SMITH
Staff Assistant
Station Electrical Division
Construction Dept
Commonwealth Edison Co
Chicago

Unusual economies have been effected in salvage of large storage batteries supplying the dc system by cutting bolts holding individual batteries with a circular saw. In the past, bolt cutters were employed to separate the 7/16 x 1⅛ in. lead support bars for removal of the plates and sledge hammers were used to break up the lead-lined, 2¼ in. thick, clear fir cases. There are 150 cases forming each battery.

After some experimenting it was found that the heavy cutting duty

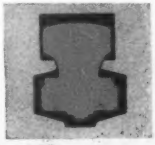
BURNDY-BUILT *to do an important job* BETTER



Comparison of Burndy Servit with other makes, reveals some striking advantages. The longer Servit head is easier to hold with a wrench. The pressure bar equals the length of the head and contributes much to Servit's higher pull-out strength. Servit is forged from high-strength silicon bronze alloy to afford exceptional durability without bulk. Furthermore, all Servits will give good results in service. Strict quality control on daily production runs keep Servit performance characteristics at a uniformly high level.

MORE CONVENIENT! — Won't stick up like sore thumb! Easier wrench grip!

SMALLER! — Servit shown against another split-bolt of comparable size.



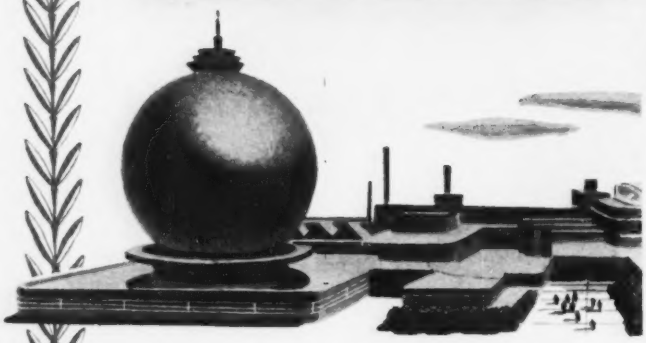
BURNDY SERVIT

STRONGER! — Head and pressure bar of equal length — bar resists crushing!

TIGHTER! — Maximum tightening force transmitted into intimate contact between conductors.

BURNDY, New York 54, N. Y.
Western Branch: Vernon 58, Calif.
Burndy Canada Ltd., Toronto 8, Ontario

. . . The Trend in Progressive Thinking



Top management is coming more and more to seek the services of independent consulting engineering organizations to supply specialized talent in working out modernization programs, new plant designs, expansions, and related projects.

The modern consulting engineering organization consists of a completely coordinated staff of architectural, civil, chemical, electrical, and mechanical engineers with broad experience in their respective fields.

For over a quarter of a century the Peter F. Loftus Corporation has had the privilege of cooperating with the management and engineers of many utilities, industrials, institutions, and governmental agencies.

Peter F. Loftus Corporation
Established 1923

ENGINEERING CONSULTANTS
First National Bank Building, Pittsburgh, Penna.

could be performed by increasing the set of the saw teeth although frequent sharpening is required. Batteries cut into uniform sections are much easier to separate and remove than the irregular, bulky, and splintered segments which resulted from the former method of dismantling the large storage batteries.

Change Oil Quickly For Remote Transformer

J. C. ELDER
Supt. of Substations
Central Division
Ohio Power Co
Canton, Ohio

Scheduled outage time was maintained and the use of many oil drums was unnecessary in changing 6,100 gal of transformer oil at a remote point by a carefully planned oil-handling procedure. Advantages of a coordinated system and inter-department cooperation was exemplified in solving the problem, which is set forth below.

Insulating oil in the 1875-kva, 3-phase, 132-33-kv power transformer at Liberty Substation, near Findlay, Ohio, had deteriorated. Although no oil-handling or storage facilities were available at that substation, it was desirable to change the oil and wash down the unit within 24 hr.

Divisions Loaned Equipment

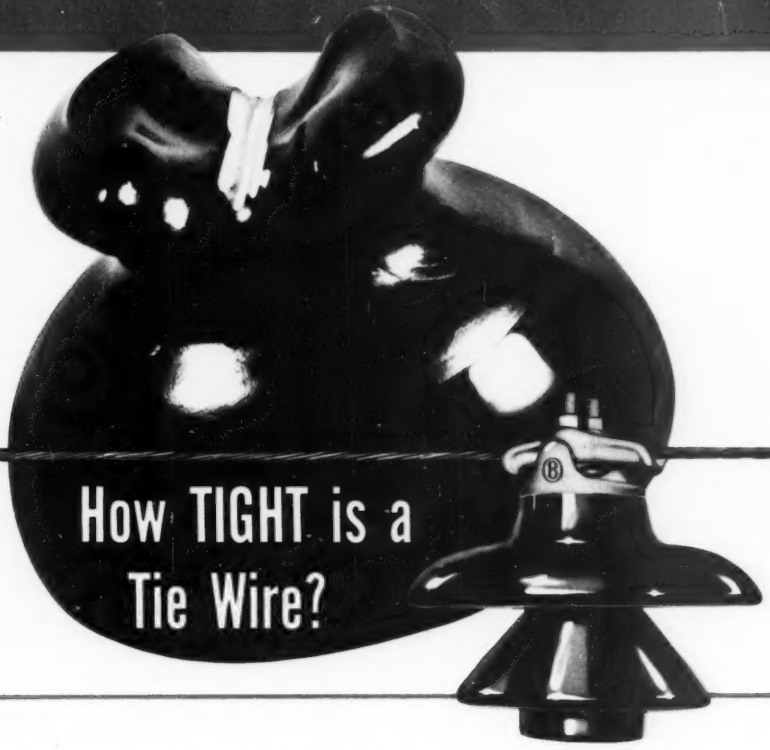
An oil-storage tank with about 1,400 gal capacity was available in the Western Division of the American Gas & Electric system. A 2,500-gal. portable oil tank and a 12-in. filter press were borrowed from the Southern Division. Fort Wayne Division of Indiana & Michigan Electric Co loaned a 1,300-gal tank truck and its driver. The local substation department had a supply of clean oil drums and a 12-in. filter press to supplement the available equipment. Stake-body trucks and drivers to handle the transportation problem were obtained from the construction and stores departments.

On the day before the scheduled oil change, the 1,400-gal tank and 55 oil drums filled with clean reclaimed oil were stored at Liberty. The same day, the 1,300-gal tank truck removed 2,100 gal of dirty oil to the Fostoria treating plant.

Starting at 8 am the following day,

(*Continued on page* 157)

HI-TENSION NEWS *Junior*



How TIGHT is a Tie Wire?

● Shown here is a pintype insulator that was attached to the conductor by an approved, "permanent," long-wire tie. In about ten years, vibration had loosened this tie, and wind plus unequal span loading finished the job! The insulator was discovered when the conductor failed from the abrasion that had caused it to saw nearly one-quarter inch into the glass-hard porcelain.

This really didn't hurt the insulator, but it produced an expensive and prolonged service outage while a new section was spliced into the conductor cable. Furthermore, it could have been prevented! By using O-B Clamptop insulators, a clamping member replaces the customary tie wire. Depending upon size of the insulator, it produces a mechanical connection of 2,000 to 2,500 pounds cantilever strength, stronger than *any* tie, and not subject to deterioration. This holding power is obtained by merely tightning two nuts, requiring no tieing skill and possibly a minute of a workman's time.

For proper tieing -- the modern way -- and the cheapest way! -- investigate the O-B Clamptop, available on both regular pintype insulators and line posts.

Ohio Brass

MANSFIELD, OHIO, U.S.A.

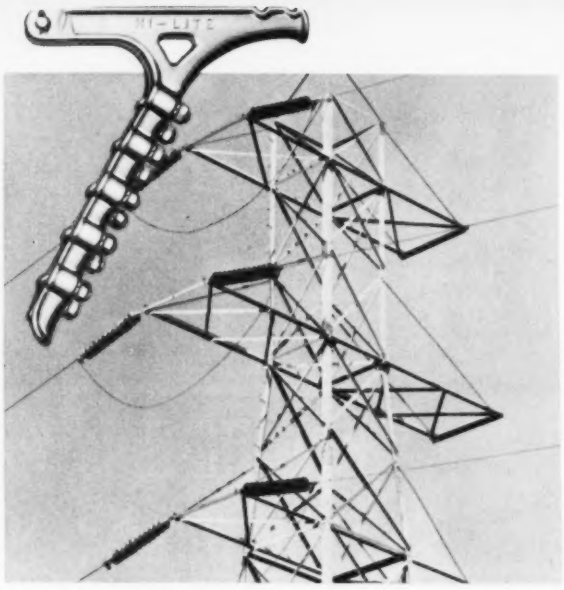
(B)

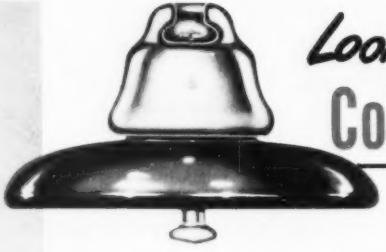
HI-TENSION NEWS *Junior*

Economies

Every way you look!

Notice, there are no splices in these jumper loops -- no sources of poor contact, corrosion, overheating and, possibly, service interruption. It costs less to build this kind of jumper, takes less time, and eliminates a potential source of serious trouble. For modern, continuous jumper construction -- that has economies every way you look -- investigate the use of O-B Hi-Lite strain clamps that make such advantages possible.





Look at the Cold Facts!

For 25 years this double-circuit, 69-kv transmission line has connected two important eastern industrial cities -- for a quarter century its operation had depended upon O-B suspension insulators. Subsequent facts speak for their performance. In the intervening years, thousands more O-B insulators have been purchased by the Power Company. On the basis of first-hand knowledge, backed by actual operating records, O-B has earned its present position of preference. When you look at the cold facts, O-B will be *your* CHOICE OF INSULATORS.

Detail view within the station showing Allis-Chalmers circuit breakers rated 600-1,200 amperes, 69 kv, 1,500,000 kva interrupting capacity; frame-mounted, pneumatically-operated, three-pole, single-throw; equipped with O-B bushings.
OHIO BRASS COMPANY
BARBERTON DIVISION • BARBERTON, OHIO
TO: ALLIS-CHALMERS
This Allis-Chalmers installation -- both transformers and circuit breakers -- is equipped throughout with O-B bushings. Every element of reliability was taken into account in this major switching station serving one of the South's heaviest load centers, hence the selection of . . .
O-B BUSHINGS
One of the Finest Components of ANY Apparatus

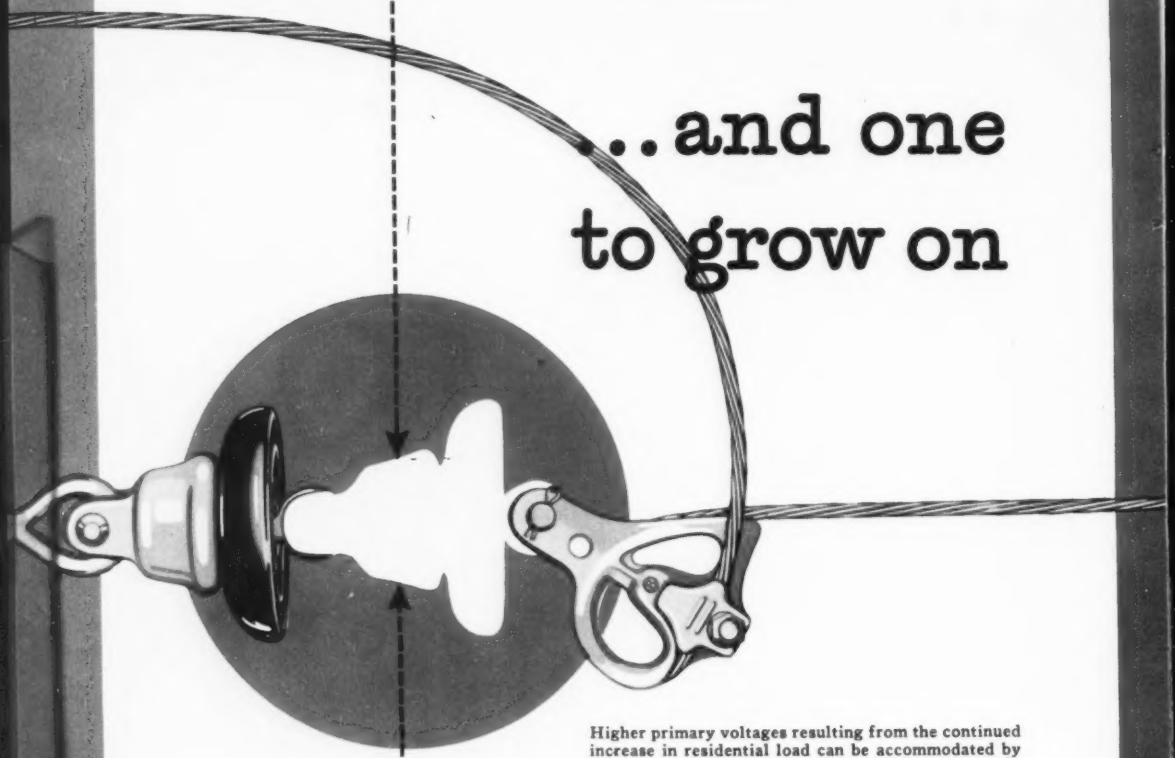
Ohio Brass

MANSFIELD, OHIO, U.S.A.

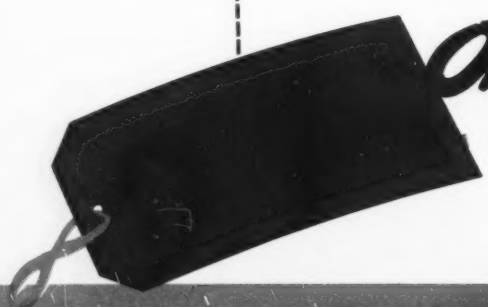
B

HI-TENSION NEWS *Junior*

...and one to grow on



Higher primary voltages resulting from the continued increase in residential load can be accommodated by specifying all deadends to be built with *two* O-B six-inch suspension insulators. During the period of voltage growth, the second unit adds a high safety factor. At the time of original construction, its insertion costs very little compared to the expense and trouble of later addition, and the deadend will then be ready for ultimately higher voltages needed to meet tomorrow's unpredictable power demands.



Ohio Brass

MANSFIELD · OHIO

4141-H

Change Oil Quickly

(*Continued from page* 152)

the remainder of the dirty oil was drained into the 2,500-gal portable tank, 1,300-gal tank truck, and 4 dirty-oil drums and transferred to the reclaiming plant. After the tank-truck hauled its first load of dirty oil and returned, it was reloaded from the 2,500-gal portable tank. The tank-truck thereafter transplanted only dirty oil.

Transformer core and coils were found in relatively clean condition, but nevertheless were flushed down with more than 200 gal of clean reclaimed oil. This was drained into dirty-oil drums and hauled to the reclaiming plant.

Tank Sealed Temporarily

By 3 pm that day, the core and coils were covered with clean oil by using one filter press with the 1,400-gal clean oil tank and the other filter press with the clean-oil drums. When the work for the day was stopped, space in the transformer tank above the oil level was filled with nitrogen gas, and the tank sealed to make it gas-tight until additional clean oil could be obtained. Several days were required to reclaim sufficient oil to complete the oil change at the Liberty Substation.

Time was saved by using the foregoing procedure. If the entire 6,100 gal of dirty oil and 6,100 gal of clean oil had been handled entirely in drums, 111 dirty-oil drums and 111 clean drums would have been required.

Aluminum Shipments in 1949 To Consuming Industries

Industry	Shipments (Percent of total)
Aluminum Limited*	
Construction	28
Transportation	21
Domestic supplies	20
Electrical	16
Food, Farming, Canning and Packing	8
Chemical and Other	7
Aluminum Co of America*	
Construction	18
Transportation	18
Power conductors	8
Domestic appliances	7
Cooking utensils	6
Machinery	4
Fabrication	25
Other	14

Source: "Aluminum, the Industry and the Four North American Producers," courtesy The First Boston Corp.

* Shipment records of these companies are presented as an alternative to the difficult task of compiling an accurate and comprehensive market list.

Since 1948 RCA microwave has been flashing Western Union telegrams from Pittsburgh all the way to Washington, Philadelphia and New York. After more than three years of continuous service, the record for reliability is almost perfect . . . *far better than corresponding experience with land lines.* Western Union has purchased sites for towers so that it can extend microwave to many other areas . . . proof enough of its outstanding performance.

Microwave is "Weather-Proof"

Signals in RCA microwave system travel on radio beam from one parabolic antenna to another. Eliminates outages due to sleet storms because *ice can't form on a radio beam.* Chain of relay towers spaced 25 to 50 miles apart relay signals over mountains and valleys, operate normally unattended. Eliminates pole lines, easements, line maintenance. *Costs less per mile than any other type of system of comparable capacity.*

Can Your Business use Microwave?

If you need *reliable* communications that can span long distances through all kinds of terrain and weather, RCA microwave is the modern money-saving answer. Let RCA engineers survey your situation. Microwave is quick and easy to install. Installation and service is available from the RCA Service Company.

Microwave offers plenty of Capacity

System offers channels for voice, supervisory controls, teleprinter, facsimile, 2-way radio and other circuits. Plenty for all your needs.

Leading Companies use Microwave

Proof of RCA microwave acceptance by industry: users include Pennsylvania Turnpike Commission, Central Arizona Power and Light Co., Arkansas Game and Fish Commission, United Gas Pipeline Company of Louisiana, many others.

Send for Free Literature . . . Now

Find out how RCA Microwave can help solve *your* communications problems. Just clip and mail coupon . . . *today.*

RCA Engineering Products
Dept. 45V, Camden, N. J.

Please send me, without obligation, full story on how new RCA Microwave can give efficient, all-weather communications without pole lines, easements, or line maintenance.

Name_____

Title_____

Firm_____

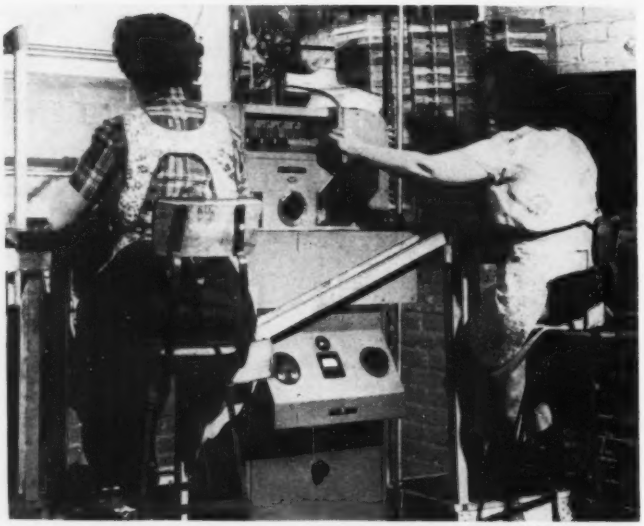
Address_____

City_____ State_____

MICROWAVE COMMUNICATIONS SECTION
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal

Ultrasonic Cleaner Cuts Operation Costs 58%



General Electric Co photo

CLEANING COSTS of electric shaver heads have been cut 58% by use of an experimental ultrasonic cleaning device. Lower section of cabinet is an ultrasonic generator which transmits sound waves through cleaning solvent in trough above, through which heads are conveyed for cleaning of corners and capillary spaces

Cleaning tiny openings in electric shaver heads, long a major problem in the electric shaver industry because of the tedious and expensive methods used, is now being successfully accomplished at Schick, Inc, Stamford, Conn., by the use of an ultrasonic cleaning device specially designed for this purpose. Company officials report that operating costs have been cut 58% since this experimental cleaning device has been used. Also the ultrasonic unit requires only 12 sq ft of floor space, 1/3rd of that required by the previous cleaner employed.

Special compounds used in grinding the parts, as well as metal particles, become lodged in the small corners and capillary spaces of the shaver heads, making cleaning by ordinary methods difficult, company officials said. The new method of cleaning simplifies the operation and eliminates brushing of each tiny opening, thus speeding the operation and cutting expense.

The ultrasonic generator, a major component of the new device, converts electrical energy into sound energy, at a frequency within the radio-broadcasting band. The sound energy is then transmitted through a cleaning solvent through which the shaver heads, mounted on a moving chain, are conveyed. As the parts pass through the activated field, grease, oil, metal shavings, and lapping compound are removed.

The machine's RF generator supplies high frequency voltage to a quartz crystal which, vibrating at its resonant frequency, generates sound waves in the liquid (saline solution) in contact with its upper face. These waves then pass through a thin diaphragm into the cleaning solvent where the cleaning action takes place. The sound waves are said to do the most thorough cleaning job of any method yet devised.

The device is easily regulated by simple controls, and is electrically interlocked for safety of operation.

Dielectric Heat Cuts Shuttle Bonding Time

Electronic heating of shuttles in bonding hard fiber by glue to the wooden surfaces of these indispensable loom parts has been pioneered with great success. The first industrial field application of this method has recently been made at the plant of the Watson-Williams Mfg Co, Millbury, Mass. The new method is now on a production basis. In a recent 10-hr run 352 shuttles were fibered with an energy consumption of 26 kwhr. The curing of the glue by dielectric heat at 190 F with an application of about 13.6 megacycles per sec required only about 90 sec per single shuttle or pair inserted together in the press. The old method of hand gluing and drying the clamped fiber sheet and wood cores at room temperature required from one to two 24-hr days before machining was possible in continuing the manufacture of a shuttle. The new method saves 35% in cost of glue.

A further advantage of this method of curing glue in shuttle bonding is that its flexibility makes short orders for special shuttles profitable. This arises from the elimination of the need for maintaining and storing many different types of molds.

Weaving shuttles are traditionally

made of dogwood or persimmon wood for high impact strength and retention of smooth contours for long periods of continuous operation. Their life is increased to commercially practicable limits by surfacing the shuttle on two or more sides with hard fiber sheeting. The fiber is attached in this plant by using a resin glue mixed with a catalyst (FM 64). The fibered shuttles are inserted either singly or in pairs by hand in an automatic press of the hydraulic type (using oil instead of water in the Millbury case). A standard steel die set makes up upper and lower platens on which are mounted the electrodes and rubber dies required.

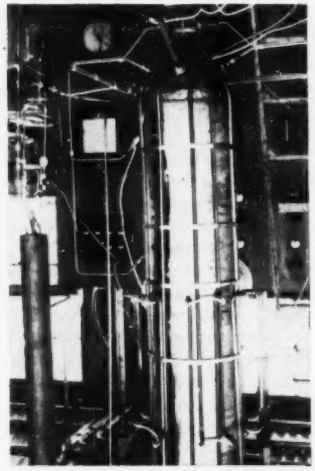
Solid rod type electrodes running transverse to the shuttle are connected with a 5 kw radio-frequency generator which supplies the energy for dielectric heating. These rods have sufficient strength so that they do not bend over the edge of the shuttle when pressure is applied, and yet are flexible enough to conform to the contours of tapered shuttles. This arrangement, plus the use of wedges placed between the rubber dies and press platens to give uniform pressure on tapered ends, allows one set of electrodes and one press to bond all the hundreds of different shapes and sizes of shuttles made. The electrode rods are ¼ in. diameter and centers are spaced ¾ in. apart. Thickness of the fiber strip bonded to the shuttle is normally 3/32 in. One or two sides may be heated at a time, but if more is required, the process is repeated. Synthetic rubber has not proved successful, since it tends to burn out. Live rubber is satisfactory for platen use. The pressure usually applied to shuttles in the process is about 2 tons. The most common size of shuttle is 1¾ in. x 16 in. long. The press will accommodate shuttles 19 in. long.

Cycle duration varies from 1¼ to 2 min. Upper and lower electrodes are of stainless steel. A 2-hp, three-phase, 230-v motor drives the pump providing the required oil pressure. Two fans are provided to cool a transformer and various vacuum tubes in the radio frequency unit cabinet.

Westinghouse Electric Corp

INSERTING SHUTTLE with fiber reinforcement glued to wooden element ready for high frequency heating in bonding press. Glue is cured between shuttle surface and fiber strip in from 1.25 to 2 min. R-F generator and control cabinet is adjacent to dielectric bonding press

Electric Heat Provides Exact Temperatures



Edwin L. Wiegand Co

EXACT PROCESS HEAT, quick heatup, and easily duplicated temperatures up to 1100 F are easily obtained with electric heat in a pilot catalytic cracker at a major Texas oil company. Mounted on the surface of the cracking vessel are a number of evenly-spaced alloy-sheathed tubular heaters, with triangular cross-section that provides a flat, contact surface for better heat conduction. Stainless steel bands hold heaters in position. Photo shows heaters before insulation was installed. Heaters vary in length and are curved to fit contours at top and bottom of vessel. Installation was quickly and easily accomplished. Service, if required, will be equally simple

INDUSTRIAL BRIEFS

HIGH BAY LIGHTING of the plate and welding shop of Western Machinery Co, Sacramento, Calif, with 750-w R-52 reflector lamps has increased intensity to average of 23 ft-c. Formerly it was 5 ft-c. Sharp cut-off of light has improved employee morale according to management. Employees feel better physically at end of day. Low cost installation, high utilization and maintenance—free operation provides advantageous incandescent system. Spacing is 19 by 25 ft at 24 ft height. Wm. J. Flynn, Lighting Representative, Sacramento Municipal Utility District, Sacramento, Calif.

Drying Cloth Samples before color-checking by infrared lamps cut drying time from 15 min to 3 min at Killingly Worsted Co, Elmville, Conn. Test pieces of cloth are hung in a 14 x 17 x 23 in. oven having four 250-w infrared lamps, set in opposite pairs 2.75 in. apart, enabling two test swatches to be tested simultaneously.

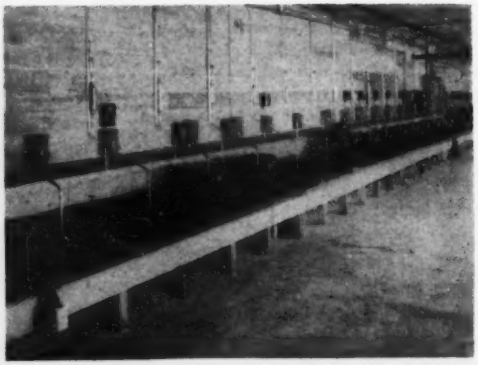
Enamel and lacquer drying is speeded by infrared oven at the Lake City Malleable, Inc, Ashtabula, Ohio, plant. New radiant infrared oven consists of three banks of 3-kw heaters—12 to a bank. It handles 1200 medium size pieces per hour. Drying cycle is 2 min with conveyor speed of 12.5 ft per min. Finishes are better, more durable, and free of blisters. Arrangement and number of heaters can be adjusted to fit castings of varying size. R. B. Mertz, Ind. Rep., Cleveland Electric Ill. Co.

Electric Unit Heaters have provided an ideal source of heat for an isolated pumping station of the North Kingsport Utility District, Kingsport, Tenn. Temperature in the unattended and intermittently operated station is kept above 50 F by 13 kw of thermostatically controlled heaters. Controls are arranged so that heaters do not operate when pump is running, thus limiting peak demand. Automatic operation, safety, convenience, and economy were important considerations favoring electric heat. J. E. Faust, Power Sales Engineer, Kingsport Utilities, Inc.

SALES AND SERVICE

RESIDENTIAL • RURAL COMMERCIAL

SMALL POTATOES in the total connected load of 569 kw at this largest super market in the Pacific northwest is the 150 kw of lighting which includes 992 of these 85-w warm tone lamps in open fixtures. Lighting level of 120 ft-c sets the pace for first-class electrical service throughout the store, including cooking and baking, refrigeration, water heating, and others



INDIVIDUAL REFRIGERATION UNITS ranging from one third to 20 hp are engineered for best performance and maximum efficiency in operating refrigerated display cases as well as storage space. Although they are centrally located in the basement to minimize distance to the individual cases, over four miles of copper tubing were required to complete installation

Electricity—Sinews of A Super Market

CARL L. HOFFMAN
Commercial Development Manager
Washington Water Power Co, Spokane

VITAL STATISTICS

Albertson's Food Center, Spokane, Washington

Lighting	150 kw
Bakery Dept.	139 kw
Delicatessen	62 kw
Fountain lunch	32 kw
Water heating	39 kw
General power	73 hp
Refrigeration	95 hp
Total connected load	569 kw
Typical month's consumption	112,560 kwh
Demand	281 kw
Load factor	53%

Electricity makes an even greater contribution to service behind the scenes than it does to customer comfort on the 30,000-sq ft sales floor of the largest super market in the Pacific northwest. Although the connected lighting load is 150 kw, cooking, baking, refrigeration, water heating, and general power requirements amount to nearly three times as much. Their total, as shown, accounts for 419 of the total connected load of 569 kw for the whole store.

Electrical equipment installed throughout the store, which is one of a chain of 16 Albertson stores in the northwest, is on a par with the 120 ft-c lighting on the sales floor. A bank of 36 individual refrigeration units ranging from one third to 20 hp located in the basement serves display cases and storage refrigeration throughout the building. Individual application of the size unit required for a given size display case assures satisfactory operation at maximum efficiency.

Electric cooking is used exclusively in the bakery and delicatessen departments, which supply food for over-the-counter sales and consumption at the store's 50-stool fountain lunch. The bakery uses a 75-kw reel type oven, 24-kw electric boiler, doughnut frying equipment, and a variety of mixing machines, etc. The delicatessen load of 62 kw includes ranges, oven, and fry kettles. Both departments depend on the close control afforded by electric heat for uniform results in food preparation.

Light on Light and Life

This piece was written after a conversation with Joe Ditchman whose work in the General Electric Lamp Department has to do with all uses of light other than for seeing. It is an attempt to indicate the significance of these other uses with some of the enthusiasm with which Joe talks about them, but without saddling him with the responsibility that would be his if his name appeared as author.

Life, both animal and vegetable, apparently is affected by light in ways and in degrees of much larger scope than is now widely accepted. Our present idea of the effect of light on living things is pretty much limited to the fact that organisms take the energy of light into their structures where it is variously employed in the processes of metabolism. In this idea a great deal of experimentation has been done, and much profit has

Here's Why You Get Extra Service with VICTOR TRANSMISSION PINTYPES

VICTOR Transmission Pintypes give extra long life because they're designed for severe service and made to rigid specifications. Each is thoroughly inspected at every point of manufacture. Performance data *proves* they furnish years of trouble-free service! Choose VICTOR—the finest insulators skilled craftsmen and modern methods can produce!

V UNEQUALLED STRENGTH! VICTOR'S de-airing process produces porcelain of maximum density, strength and resistance to impact.

V CUSHION COATED JOINTS absorb thermal variations and mechanical shock.

V SMOOTH, HARD GLAZE protects against weathering and contamination, assists self-cleaning, reduces maintenance and replacement costs.

VICTOR NO. 245 TRANSMISSION PINTYPE INSULATOR. For complete engineering data on this insulator and other sizes and types, write today for Bulletin No. 4.

V LARGE RADIUS TOP AND SIDE WIRE GROOVES make hot-tying quick and easy.

V QUALITY CONTROL! All shipments of flint, feldspar, and clay are stored in separate bins and tested for quality and purity before use.

V CONTROLLED TESTING and PROCESSING of cement assure highest bond strength at assembly joints.

V HIGHEST QUALITY WET PROCESS PORCELAIN gives unexcelled dielectric and mechanical characteristics.

Do You Know that...

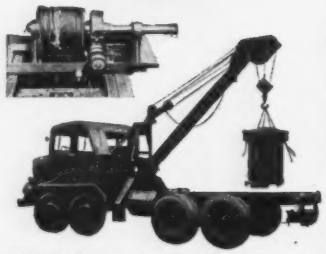
VICTOR carries a complete line of transmission and distribution line hardware. These high quality products include aluminum, forged steel and malleable iron strain and suspension clamps as well as arcing horns, yoke sets and other allied fittings.

Specify VICTOR TRANSMISSION PINTYPES

VICTOR INSULATORS, INC. VICTOR, N. Y.

Utilities Have Specified
SILENT HOIST Equipment
• Since 1918 •

KRANE KAR Swing-Boom Mobile Crane: for materials-handling . . . lifting, transporting, positioning, gasoline or Diesel, 1½, 2½, 5 and 10 ton capacities, 9 to 37 ft. booms (or telescopic booms), solid or pneumatic tires. Self-stabilizing without jacks or outriggers; unobstructed vision; fast, flexible, safe, easy to operate.



WINCHES: Capstans; Single and Double Drum, Jaw Clutch, Keyed and Friction Clutch Winches. 2,000 to 50,000 lb. Capacities.

SWING-BOOM CRANES: Truck: Motor Power Operated; high capacity; takes up only a small space. For handling transformers, cable reels, lamp posts, trees, poles, manhole castings, etc. 9 to 31 ft. booms; one to 10 ton capacities.

TOWERS: 2 or 3 section type and Pantograph types, with plain, revolving or rocking platforms.

TRIPOD POLE DERRICKS: for 35 ft., 45 ft., and 60 ft. Poles; single piece or telescopic side legs; removable cast steel fittings.

USERS: AT&T; N. Y. Tel. Co.; T.V.A.; Consolidated Edison Co.; W.U.; Municipalities throughout America.

WRITE FOR CATALOGS:
No. 79—KRANE KAR *No. 70—Truck Equipment*

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER
2½, 5, AND 10 TON CAPACITIES
KRANE KAR
TRADE MARK REGISTERED
SILENT HOIST & CRANE CO.
862 63rd ST., BROOKLYN 20, NEW YORK

resulted from it in methods of forcing and otherwise controlling plant and animal growth and development.

These experiments have been based on the concept that quantity of light and amount of energy absorbed from it are the determining factors in the effect on living things. For instance, in commercial horticulture flowering plants are hastened towards blooming by controlled lighting. And everyone has heard of hens persuaded to greater egg production by lighting their boudoirs. Although in these developments it is more and more being recognized that color quality of light is also a determinant of effect, the basic idea has been that the ultimate result is a function of the amount of light energy absorbed by the organism.

Now it is beginning to appear that this idea, if not entirely wrong, is not entirely right, either. The effect of light on living things is much more than is contained in the concept of absorption of energy and stimulation of activity.

The rhythms of night and day, of the seasons, and probably of other cycles of the universe are the underlying determinants of all life—seed, growth, maturity, and decay. These rhythms have their counterparts in the multitudinous rhythms of life itself as manifested in its numberless animal and vegetable forms. The pulse beat in the wrist is linked in rhythm with the life cycle of the seventeen-year locust. Of all the rhythms of nature, that of light and darkness is the one most immediately apparent, and it is certainly one that has great effect on most forms of life.

It is in respect to this rhythm that we are beginning to learn more about the effect of light on living things. Our dawning knowledge points to the idea that the application of light outside of the natural rhythm of light and darkness is perhaps a larger factor in modification of life processes than is the amount of energy taken up by the organism from such application. In other words, the rhythm of light and darkness has been changed with consequent result in modification of the rhythms of life processes.

The proprietor of a mink ranch installed lighting along the fence around

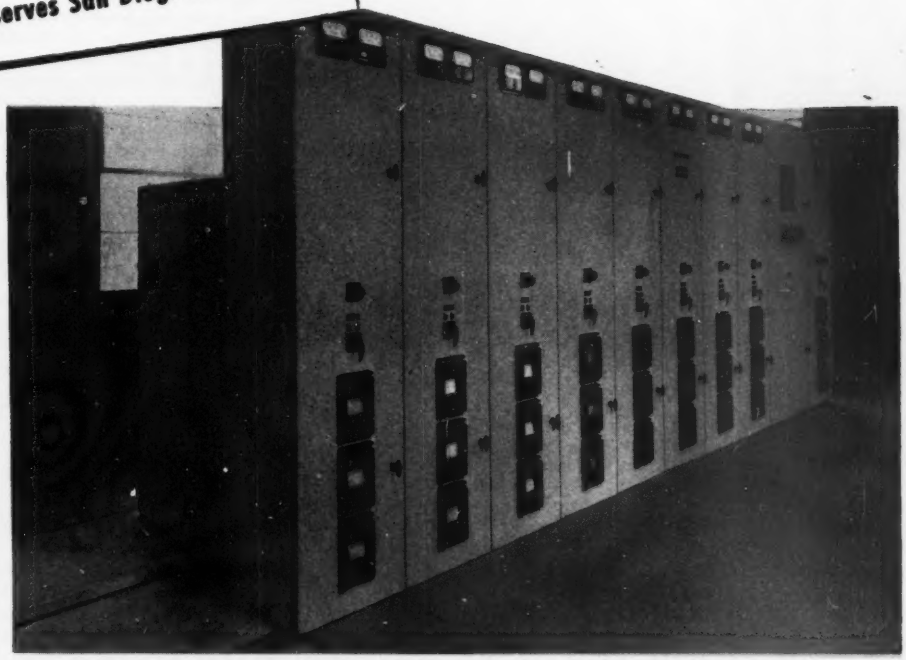
(Continued on page 164)

Black Light Sign Uses Germicidal Lamps

Westinghouse Electric Corp

SPECIAL LUMINOUS PAINT containing chemicals tuned into the same wave-length of invisible ultraviolet light that kills bacteria creates the effect shown on this sign in Berwyn, Ill. The new paint, excited by germicidal ultraviolet, is said to respond with a much higher intensity of light than is produced with "back light" paints. Two 15-watt lamps are hidden behind the cornice under the words "Cocktail Lounge" and stool legs are painted on background of shadow box

Westinghouse Switchgear serves San Diego Marine Base



This 2400-volt Metal-Clad Switchgear installation serves power and lighting circuits at the Marine Corps San Diego Recruit Depot.

"...Its design eliminates operating hazards!"

This new Westinghouse Switchgear installation points up many advantages of replacing obsolete protective equipment with modern switchgear.

"... Because its design eliminates operating hazards, the new equipment provides a big margin of safety over the old installation. Safety interlocks and complete isolation of live parts make switching, circuit testing, and breaker exchange as safe as turning on the lights.

"Lower over-all cost is anticipated also. Complete factory assembly and testing of the unit have resulted in substantially reduced installed cost . . . and its standardized design provides ample flexibility for low-cost expansion or conversion of the depot's power system."

This is how Ets-Hokin & Galvan, Electrical Contractors on this job, sum up this Westinghouse Metal-Clad Switchgear. And they cover only a few of the benefits this modern equipment offers to *you*.

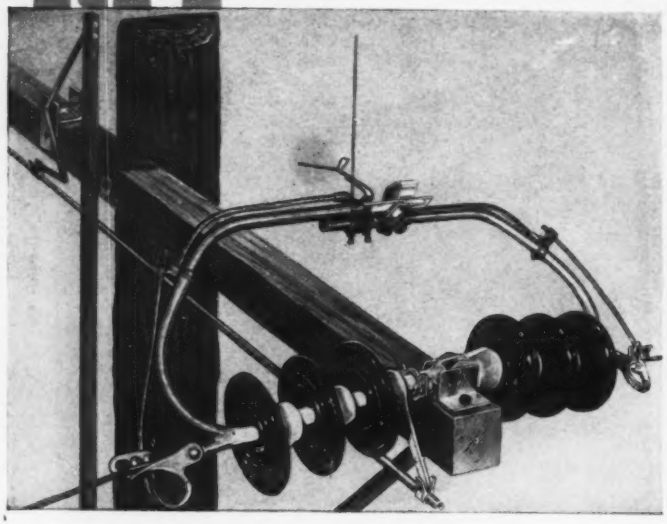
For complete information write for Booklet B-4016. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-60757

YOU CAN BE SURE ... IF IT'S Westinghouse

METAL-CLAD SWITCHGEAR

KPF POLE TOP SWITCHES



Simple design means more switch ...for less money!

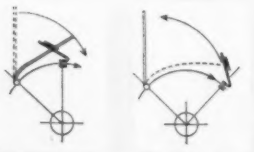
KPF Pole Top Switches cost less because they are simplest in design. They lower installation costs because they bolt on a single crossarm in minutes, require no extra insulators. KPF switches save, too, on upkeep; simple push-pull interphase rods never bind because of crossarm warpage; monel and bronze bearings never need lubrication.

KPF switches may be used in horizontal, vertical or triangular mounting. Free floating, self aligning blades and jaws maintain proper contact under all conditions of switch sag adjustment.

NEW QUICK-BREAK ATTACHMENT FOR KPF SWITCHES

The split-second breaking speed of these new KPF attachments means you can switch many circuits without using expensive circuit breakers. Attachment is available for all KPF switches rated 15 to 69 kv.

WRITE FOR DETAILS



Spring rod winds to full tension as switch opens.

Rod springs clear, breaking contact at high speed.

KPF ELECTRIC COMPANY
1624 E. Alpine Avenue • Stockton, Calif.

his place as a protection against thievery. It was satisfyingly effective. The number of mink missing at morning roll-call dropped to zero. He was very happy. But as time went on he found that his profitable little friends were producing fewer and fewer offspring. His loss from the reduction in number of blessed events soon surpassed the loss he had previously suffered from thievery. A careful survey of the circumstances showed that the only change in the mink environment and care had been the installation of the fence lighting. No one could say that this had affected the vital statistics of the mink population. But it was the only thing different from before. So the lights were turned off. Soon the animals were again doing their problems in applied arithmetic with their customary enthusiasm.

What had happened was that the reproductive rhythm of mink life had been thrown out of phase by light when nature said there should be none.

Effect of Light on Sugar Cane

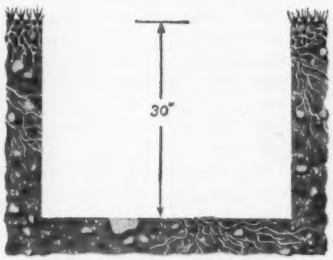
The same effect, although with happier result, was had from lighting a field of sugar cane. Floodlights were installed in one field. An adjacent field of the same size and soil was not lighted. The lights were turned on each night for a much shorter period than would have been accepted as necessary in customary practice for forcing plant growth. Yet the canes grew faster and larger just as they would have been expected to do if the customary practice of comparatively long lighting time had been followed. Moreover, they showed a considerable reluctance to flower and go to seed. Instead they just kept on growing. What was happening was that the plants were held in the vegetative, the growth, stage of their life cycle; their reproductive function held in abeyance, which was what had happened to the mink.

In comparison with the unlighted control field adjacent, the lighted field produced cane as much as 25% taller and thicker. This cane was still growing when that in the control field had gone to seed.

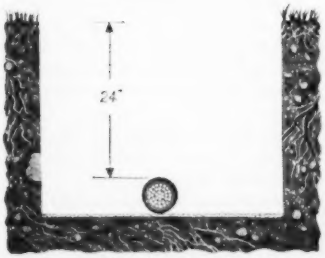
These and other instances that might be brought forward do not justify any conclusion except that there is much more to the effect of light on plants and animals than merely the one phenomenon of energy absorption. There is much more to be learned about light and life.

How to install buried cables in trenches

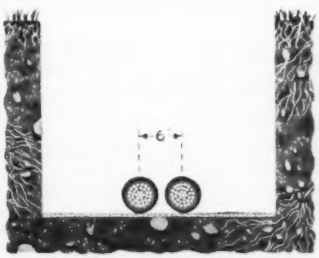
The most generally satisfactory way of installing buried cables is to lay them in a trench on a cushion of sand. There is less bending, distortion or tension than when a cable plow is used, a valuable factor if strains later occur through earth settling. The cable can also be protected by a treated plank or slab of concrete laid over it. Trenching permits the installation of cables at generally greater depths than does plowing. This greater depth makes cables less subject to damage by insects or rodents.



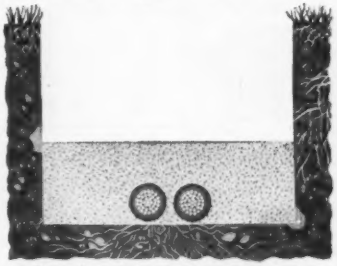
1. The trench should be deep enough (about 30") so that the cable, after providing the cushion mentioned below, will be at least 24" below the surface. This reduces the possibility of mechanical damage.



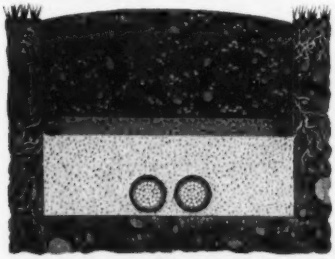
2. Put a cushion of sand on the bottom of the trench, or at least make sure the bottom is free of stones and other harmful debris. Lay cable with a slight snaking, to allow for earth settling and for expansion and contraction during load cycling.



3. When two or more cables are installed in the same trench, they should be spaced uniformly about 6" between centers so that the sand or earth can fill in around them. There must be no criss-crossing.



4. Cover the cable or cables to a depth of about 6" with sand or soft earth free from stones so that no rough edges will press against them.



5. Lay a concrete slab or creosote-treated plank on the sand or soft earth refill, to protect the cable and warn workmen of its presence. Complete the refill. Under highways, streets and rights-of-way, cables should always be installed in conduit.

Because of today's scarcity of rubber and copper, great care should be taken to see that your installations last as long as possible. With a few simple precautions, you can extend the life of your cables under normal operation. Although these precautions are well-known to many, we repeat them in the interest of getting maximum efficiency and long life out of our material and resources.

U.S.RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

Electrical Wire and Cable Department

ROCKEFELLER CENTER • NEW YORK 20, NEW YORK

NEW EQUIPMENT

Oil Circuit Recloses

The Kyle Type E Oil Circuit Recloser is a single-phase unit which provides self-contained protection against temporary or permanent line faults, on nominal 23 kv systems. It provides three consecutive automatic reclosing operations, or four openings, including the final lockout operation.

Protection is provided for circuits with load currents up to 100 amperes, and fault currents up to 1500 amperes.

The timing of all operations is controlled hydraulically. The hydraulic system counts the consecutive opening operations to trip the lockout mechanism after a fourth opening, and controls the reset when the fault is cleared in less than four opening operations.

Operating handle is trip-free—it will not impart a blow to the operator when manually closed on line faults.

Contacts cannot fall closed when operating handle is in the open position.

Line Material Co, Milwaukee 1, Wis.

Electro-Mechanical High Speed Camera

The addition of a second lens to the Kodak High Speed Camera to record the images on the tube of a cathode ray oscilloscope through the back of the film, permits the simultaneous recording of mechanical and electrical action.

Film speed, as indicated by an edge marking argon lamp provides a time base.

Inasmuch as the film is traveling in a vertical direction only horizontal deflection is used.

Trace may be placed at any desired position within the width of the picture field where it will not conflict with subject being photographed.

Eastman Kodak Co, Rochester, N. Y.

•

Climate-Survey System

Drag-free anemometer characteristics and electronics data techniques are combined to provide accurate recordings of wind direction and wind speeds from a threshold below one to 30 mph.

Speed and direction recordings are made on separate standard pen-type 0 to 1 milliammeters. Two speed ranges are provided: 0 to 10 and 0 to 30 mph.

The system is suggested for use in smog surveys, river flood forecasting, and investigations of light winds which have major influence on the build-up of effluents from smokestacks and other sources of industrial atmospheric contamination.

Beckman & Whitley Inc, 912 San Carlos Ave, San Carlos, Cal.

Multi-Stage Mechanical-Drive Steam Turbine Line

A newly-designed line in ratings from 200 to 5,000 horsepower has been announced by GE.

Type DP multi-stage, rated from 200 to 3,000 hp, designed for driving pumps, fans, blowers, etc.—equipped with a hydraulic governor which provides a 30 per cent speed range and 6 per cent regulation.

Type DR, rated 200 to 5,000 hp, is built for applications requiring wider speed range, greater accuracy of control, and greater capacity. Oil-relayed governor makes possible a 6 to 1 speed range, with only 4 per cent regulation and ½ per cent steady state variation.

Type DRV has range and governing characteristics of the DR but utilizes automatic sectional valves linked to the oil relay governor to minimize throttling losses under fluctuating load factors.

Type DRVX designed for applications where process steam is desired at a definite, steady pressure.

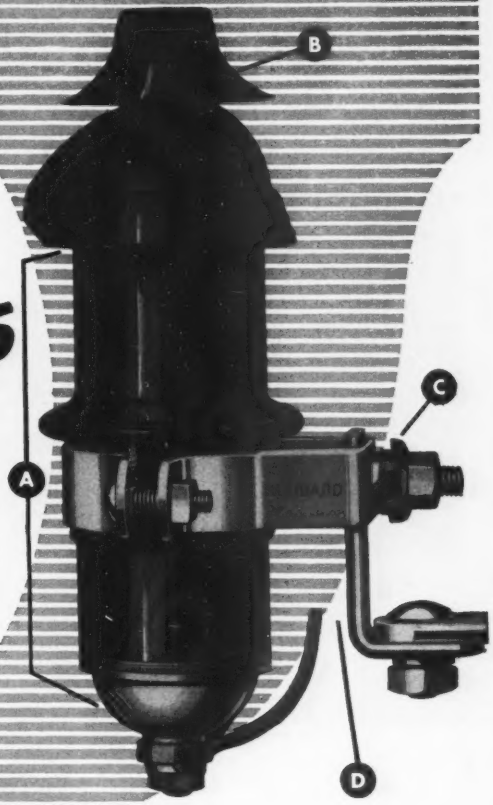
General Electric Co, Schenectady

•

Ground Wire Clip

Securing ground wires to poles on power lines with this new clip prevents radio interference due to sparking between clip and wire. Contact

ALL THE AUTOGAP ADVANTAGES *plus* LINE TERMINAL INSULATION



HUBBARD Line Insulated Autogap Lightning Arresters are the answer for utilities who do not approve of exposed hot line terminals. When lines are worked hot, exposed terminals present a constant hazard, especially on congested poles. The insulated line terminal also prevents bird trouble.

Electrically, these insulated Autogaps have the same characteristics as other Hubbard Vertical Autogap Arresters. Salient points are indicated in the illustration. The line terminal at the top of the arrester is protected by a bakelite cap.

The external gap is between the arcing horn and the "L"-shaped extension of the grounded mounting bracket.

Standard EEI-NEMA mounting brackets are supplied—No. 2337 for Crossarm mounting or No. 2338 for Pole mounting.

A *TWIN EXHAUST an exclusive Autogap feature, assuring maximum surge capacity.*

B *Bakelite insulator cap covering line terminal.*

C *Ground terminal attachment.*

D *Air gap.*

HUBBARD AND COMPANY

ESTABLISHED 1843

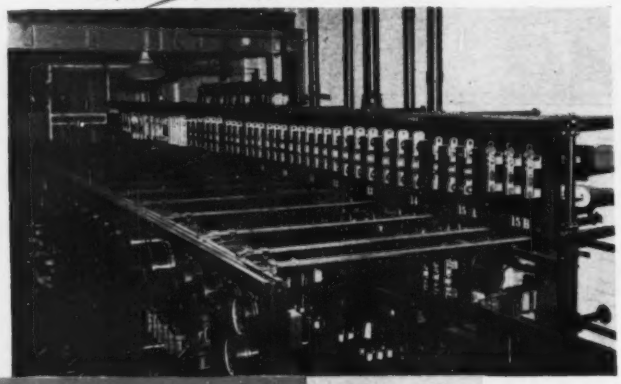
PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

Anticipate* Destruction

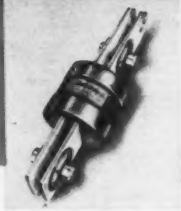
Amp-trap PREVENTS DEVELOPMENT OF HEAVY SHORT CIRCUIT CURRENTS

* To preclude or prevent by prior action — Webster



SHAWMUT Amp-trap*

"T.M. REG. U.S. PAT. OFFICE"



Amp-trap installation at Bird & Son, E. Walpole, Mass., raised the interrupting capacity of the system from 20,000 amperes to 100,000 amperes R.M.S. at 600 Volts, 60 Cycles.

NEW, LOW-COST SHORT CIRCUIT PROTECTION

Amp-trap, with its 100,000 RMS Interrupting Capacity, opens the circuit so fast that it *precludes* the development of the peak available short circuit current. Consequently, it *prevents* both magnetic and thermal destruction. Even phase-to-ground faults are cleared so quickly that multi-conductor faults are usually avoided.

CERTIFIED AND APPROVED

Amp-trap is listed by Underwriters Laboratories. Interrupting tests up to 202,000 amps at 500v 60 cycles have been witnessed and certified by Electrical Testing Laboratories, Inc. Amp-trap is favored by many insurance companies.

FOR SYSTEMS OLD OR NEW

Amp-trap is supplied in all standard ratings up to 4000 amperes for application on any circuit up to 600 volts AC or DC. It can be used on either old or new switchgear with a minimum of structural rearrangement. "Outage" time for installation is negligible. There is no better way to insure your investment in switchgear, bus-ducts, motor starters, circuit breakers and current transformers. Every service entrance on a network system needs Amp-trap protection. The list of Amp-trap users reads like the Blue Book of American industry. Investigate now.

"You Can Get Amp-traps"

WRITE FOR FREE AMP-TRAP BULLETIN TODAY.

REGISTERED UNITED STATES PATENT OFFICE Est. 1890

AMP-TRAPS — *Awake At The Switch*

THE **CHASE-SHAWMUT CO.**

370 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS

pressure with the wire is independent of its hold on the pole—pressure on wire remaining constant after prolonged exposure.

Clip is first driven part way into pole and ground wire slipped under hook. A few more hammer blows bend the hook causing it to grip wire. **James R. Kearney Corp, 4236 Clayton Ave, St. Louis 10, Mo.**

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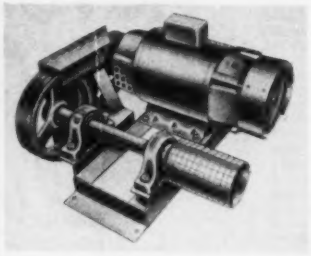

Farm Stand-By Generator

Powered by the farmer's tractor, this unit can be put into operation in just a few minutes time in the event of a power line failure.

Normal output is 3,000 watts at either 115 or 230 volts with a starting load capacity of 5,000 watts. **Windcharger Corp, Sioux City, Iowa.**

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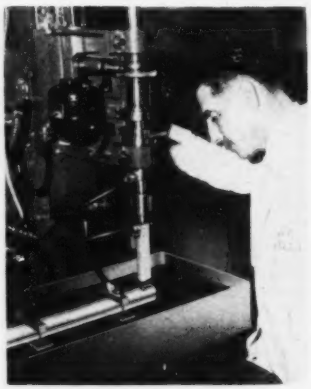


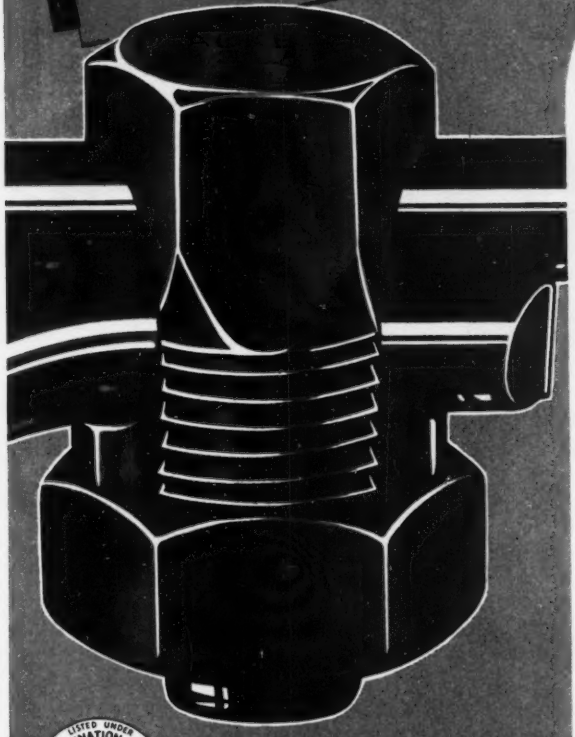
Method X

Machining action of this new metal removal method depends upon the mechanical not the thermal effect of electricity.

Internal mechanical stresses set up by extremely high current densities cause metal particles to detach themselves from the work.

Method X machine is similar to a

These 2 Things Make a GOOD Connection!



LISTED UNDER UNDERWRITERS' LABORATORIES, INC. REEXAMINATION SERVICE UL

BLACKBURN Hi-Strength CONNECTORS

1

High Pressure Contact Between Wires:

It is fundamental that **high pressure** contacts are **better** electrical contacts. Also, it is necessary to have high pressure to keep the wires from sliding, rolling or moving within the connector, as the power lines sway in the wind. High pressure effectively seals the contact surfaces from moisture and oxidation and produces a lasting low resistance connection. Tests show that BLACKBURN Connectors definitely produce these high pressure contacts.

2

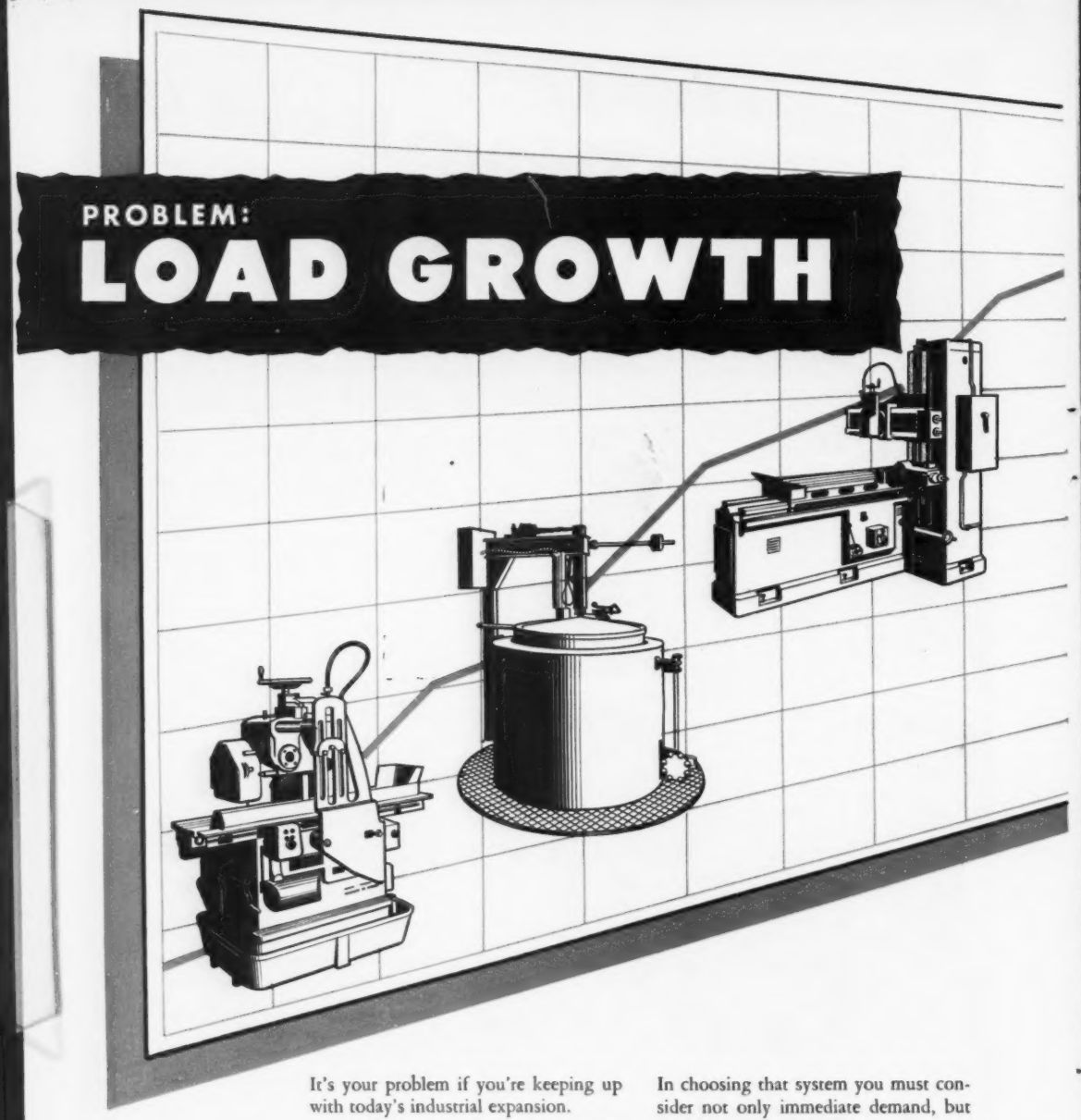
Ability to Maintain This High Pressure Contact:

The connector must have sufficient strength to make and **hold** a high pressure connection. It must not yield or stretch and loosen up with time. BLACKBURN Hi-Strength Connectors are made of Duronze, a silicon bronze alloy which is actually stronger than structural steel. They have that **extra strength** so vital to a good connector.

YES, BLACKBURN Hi-Strength Connectors (1) make high pressure connections and (2) have that extra strength required to **hold** the high pressure connection. It pays to use the best—it pays to use BLACKBURN Connectors.

JASPER BLACKBURN CORP.
35 MADISON ST., ST. LOUIS 6, MO.

Phone CEntral 3007



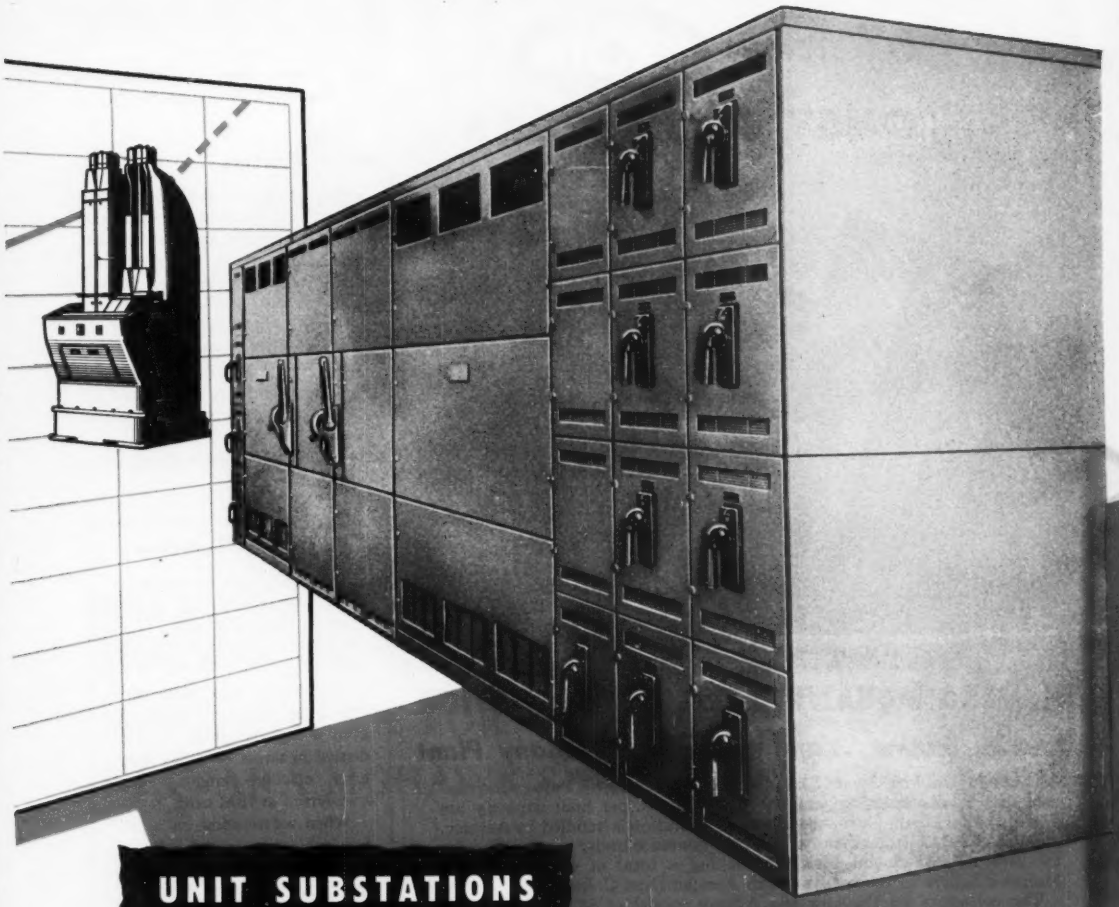
It's your problem if you're keeping up with today's industrial expansion.

And when new production machinery adds load upon load to your electrical system, your planning naturally includes installation of a unit substation system.

In choosing that system you must consider not only immediate demand, but also future expansion. The system must be designed and engineered to meet your specific requirements, flexible enough to be expanded for future needs.

THE ANSWER: I-T-E UNIT SUBSTATIONS!

I-T-E Catalog 9000 describes all types of secondary unit substation equipment, offers concise, easy-to-use information on selection of distribution systems and equipment. One page alone, on cost comparison of basic power distribution systems, may save you weeks of investigation and reduce initial investment. Send for Catalog 9000. I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Philadelphia 30, Pa. Subsidiaries: Railway and Industrial Engineering Co., Greensburg, Pa.; Eastern Power Devices, Ltd., Toronto.



UNIT SUBSTATIONS

Here is a typical I-T-E indoor unit substation with air cooled transformers. Substation arrangement puts primary load break interrupter switches and transformers in the center. As load grows, addition of low voltage switchgear to either end is simple and inexpensive.

Uniform appearance of the structure and symmetry of enclosing panels are consistent with the operating excellence of I-T-E switchgear.

The I-T-E Company

high efficiency AEROTEC
DUST COLLECTORS
Partially erected collector showing inlet, outlet and dust discharge passages.
New Niagara Mohawk Power Corporation Dunkirk Steam Station, equipped with Aerotec Dust Collectors.
assure your plant the same protection given the new

NIAGARA MOHAWK POWER CORPORATION

Dunkirk Station . . . and a duplicate Albany Plant

At the new Dunkirk Steam Station of Niagara Mohawk Power Corporation, two reheat steam generators of 670,000 lb. per hour capacity are pulverized fuel-fired. Dust collection for this station is handled by Aerotec, Design 3 RAS Collectors, and a duplicate system is under construction for the new Albany Steam Plant . . . making a total of eleven Niagara-Mohawk boilers to be equipped with Aerotec Dust Collectors.

The collectors for Dunkirk and Albany consist of 84 "Unit Building Block" elements completely assembled at the factory for easy erection in the field. The small diameter tubes, of permanent molded aluminum construction, have proved their extremely high collection efficiency and long life on hundreds of installations. Their light weight cuts steel requirements for supporting structure, and makes possible roof installations with a minimum of reinforcement. The light weight tubes also reduce erection costs.

Aerotec efficiencies meet or exceed the requirements of most dust ordinances today. Evenly spaced tube outlets provide excellent inlet flow conditions for an AEROTEC electrical secondary—should future ordinances require still higher efficiencies.

Write for the new Design 3 RAS Catalog No. 601.

Project and Sales Engineers

THE THERMIX CORPORATION

GREENWICH, CONNECTICUT

(*Offices in 28 Principal Cities*)

Canadian Affiliates: T. C. CHOWN, LTD.
1440 St. Catherine St., W., Montreal 25, Quebec • 50 Abell St., Toronto 3, Ontario

THE AEROTEC CORPORATION

GREENWICH, CONNECTICUT

Manufacturers of mechanical dust collectors, electrical precipitators, air cleaners, industrial integral dust collectors, gas-oil scrubbers and dust reclaiming equipment.

drill press with work submerged in a dielectric fluid. Electrode feed is controlled by an Amplidyne.

Firth Sterling Steel & Carbide Co, 3113 Forbes St, Pittsburgh 30, Pa.

•

Motor Starters

Types RAR and RAS extend the manufacturers scope of line starters to include reversing and multi-speed motors. Featured is the right-angle operated mechanism, reduced size and weight, increased efficiency and straight-through wiring.

Starters are available in NEMA housing type I for indoor use, and NEMA housing types IV, VII and IX for exposed and hazardous industrial applications.

Arrow-Hart & Hegeman Electric Co, Hartford, Conn.

Information Searcher

Photo-electric eyes read scientific information from IBM cards at the rate of 1,000 cards per minute. Briefly, this is how it works.

Information contained in a book, an article, abstract, or even a key paragraph, is condensed in terms of a 792 character machine language and transferred to IBM cards.

When information on a certain subject is desired a "question" card is placed in the searcher. Machine then proceeds to match the question and information cards, selecting those which give the answers or tell specifically where the answers can be found.

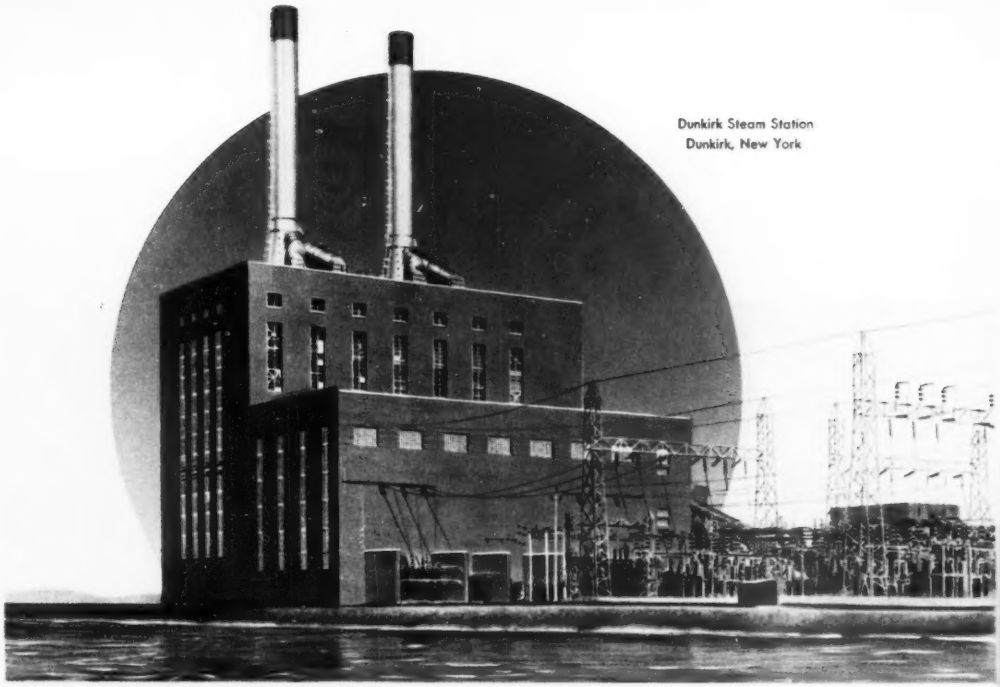
First application of the new method is likely to be in chemistry — searching for similar chemical compounds. Corresponding problems exist in other branches of engineering, law, medicine.

International Business Machines Corp, New York City, N. Y.

Flat Electric Heating Element

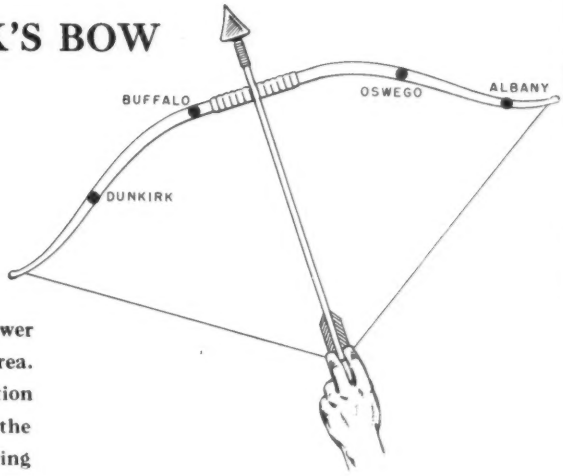
Flat, sheathed electric heating element for contact heating provides for convection and air flow. Units available in many shapes are resistant to moisture and vibration.

No arcing or sparking occurs



Dunkirk Steam Station
Dunkirk, New York

MORE POWER FOR NIAGARA MOHAWK'S BOW



The new Dunkirk Steam Station adds 160,000 kw of thermal generating capacity to the western end of the Niagara Mohawk Power Corporation system. This is an important step in the expansion program planned to satisfy the rapidly increasing industrial power demand in the Upper New York State area. Stone & Webster Engineering Corporation was the supervisor of construction of the station which was designed by the engineering staff of Niagara Mohawk.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY of STONE & WEBSTER, INC.

LONG JOHN* puts plenty of space between aerial cable and pole....

effectively preventing chafing of cable on outside corners

"LONG JOHN" is for outside corners only, so you won't need him as often as our other Aerial Cable Clamps, but you only need one outside corner to learn how useful he can be, particularly when straight lay cable is used.

MIF Aerial Cable Clamps offer *maximum flexibility*. A wide range of spacing is available, as detailed in the specification table below.

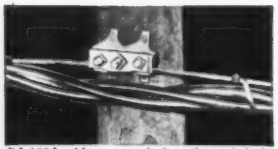
MIF Aerial Cable Clamps permit placing the messenger above or below the through bolt to comply with your practice or to meet special conditions.

MIF Aerial Cable Clamps simplify corner installations as the belled ends of the messenger grooves permit turns of from 30° to 90°, depending on the clamp.

MIF Aerial Cable Clamps have a pole-conforming base (the feet are tangential to average pole diameter). Large pads and spurs transfer the load to the pole in such a way as to minimize overturning and slotting down. The relation of the Clamping Plate to the Body Member is carefully worked out so that the load is supported by the Body and wedging of the messenger is avoided.

MIF Aerial Cable Clamps *combine in one device* a Clamp, Support, Spacer, and Pole Plate.

PA 192A—Messenger above through bolt. Note clearance from pole and belled ends of messenger groove.



PA 192A—Messenger below through bolt. To place messenger above through bolt clamp is reversed.

PA 198—Body member is tapped to assure maintenance of constant relation between Body member and Clamping Plate.

PA 198—Messenger below through bolt. To place messenger above only Clamping Plate is reversed.

SPECIFICATIONS

	HEAVY DUTY CLAMPS			SINGLE BOLT LIGHT DUTY CLAMPS	
	PA 192A	PA 178	PA 193	PA 197	PA 198
Messenger diameter, range	5/16"—1½"	⅜"—⅝"	5/16"—½"	#6 A.W.G.—½"	#6 A.W.G.—½"
Clearance—face of pole to center of messenger	2¼"	2½"	6"	1½"	2"
Maximum size of through bolt accommodated	⅝"	⅞"	⅝"	⅝"	⅝"
Clamping bolts (2 of each)	½" x 2"	⅝" x 2"	½" x 2"	Through bolt serves as Clamping Bolt	
Maximum recommended load (vertical)	2500 lbs.	4000 lbs.	——	1800 lbs.	1800 lbs.
Shipping weight per 100 pieces	290 lbs.	520 lbs.	575 lbs.	90 lbs.	105 lbs.

PATENTS APPLIED FOR

MIF

MALLEABLE IRON FITTINGS CO.

Pole Hardware Div., Branford, Conn.
N. Y. Office, 30 Church St.

Representatives: William J. Cottrell Company, Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engineering & Equipment Corp., Los Angeles, Cal. • JSG Electric Company, Chicago, Illinois • E. A. Thornwell, Inc., Atlanta, Georgia • J. P. Voight, Summerville, S. C. • Waltham, De Witt & Krusi, San Francisco, Calif. • L. R. Ward Company, Dallas, Texas • L. G. Wendegatz, Kansas City, Mo. • Williams Sales Agency, Fort Myers, Fla. • Williamson Sales Company, Shreveport, La. • O. C. Witte Company, Detroit, Mich. Line & Cable Accessories, Ltd., Toronto, Canada

through the copper or steel sheath.

Can be supplied with self regulating characteristics where their wattage varies inversely with heater temperature.

Available with a variety of terminals, lengths to 10 ft, and in widths of 33/32 in. or 17/32 in.

Syntron Co, Homer City, Pa.

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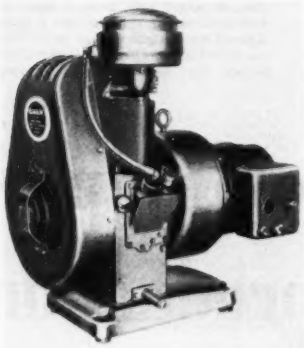

Diesel Electric Plant

Driven by an air-cooled four-cycle single-cylinder Diesel engine the 3,000-watt Model 30SP-1E generates 115 volt 60 cycle, single-phase current.

Push-switch control for electric cranking, manual compression release and an electrically heated glow plug for cold weather starting are provided.

Fuel consumption is reported to be 0.155 gallon of low-cost furnace oil per kwhr at full rated load.

D. W. Onan & Sons, Minneapolis 14, Minn.

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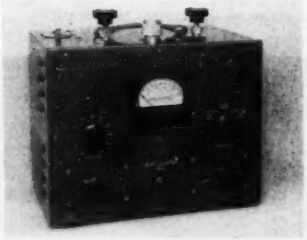
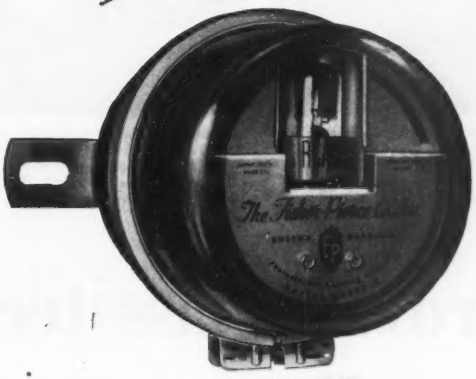


Vacuum Leak Detector

Heart of the new EMJ-7 leak detector is a sealed-off, vacuum gage tube, type 1945 which responds only to hydrogen. The instrument is capable of detecting leaks as small as

Improved....



Series 63300 B

FISHER-PIERCE

PHOTOELECTRIC CONTROL

FOR STREET LIGHTING

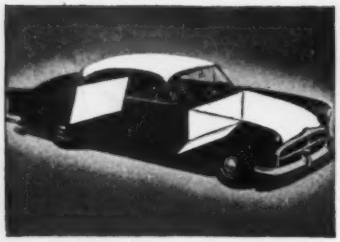
This new Fisher-Pierce Control is the result of long experience in design and manufacture, combined with practical experience of more than 600 electric ultilities in more than 20,000 installations.

The new 63300 B Control is mechanically and electrically interchangeable with existing controls. The same dependable Fisher-Pierce circuit, consistently giving tube life of more than 20,000 hours has been retained. Improved spacing and insulation provides increased protection against lightning damage . . . up to 2500 volts rms Hipot. Mechanical design has been altered to provide maximum simplicity for greater economy of servicing.

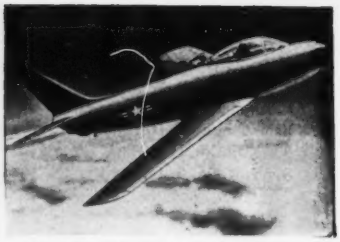
The FISHER-PIERCE Co., Inc.

82 PEARL STREET, SO. BRAINTREE, BOSTON 85, MASS.

Automobile tops, insulated with L·O·F Fiber·Glass against heat and cold, increase passenger comfort. Easy installation. Light weight. Won't deteriorate under normal conditions.

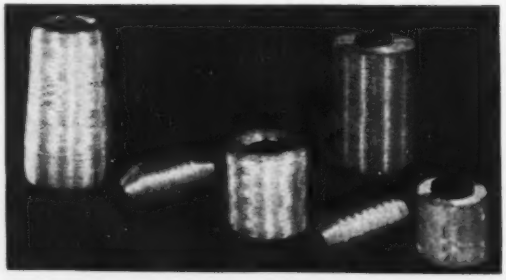


Automobile sound insulation a made-to-order job for L·O·F Fiber·Glass. Easy installation in doors, under the dash, on the fire wall, under the hood. Low moisture absorption, light weight.

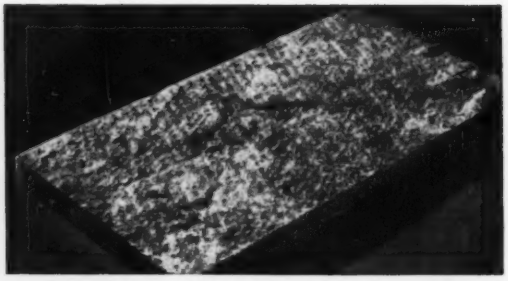


Aircraft sound and thermal insulation. Get these advantages of L·O·F Fiber·Glass. Light weight (as low as .3 lb. per cu. ft.). High fire safety. Low moisture pickup. High sound-insulating efficiency.

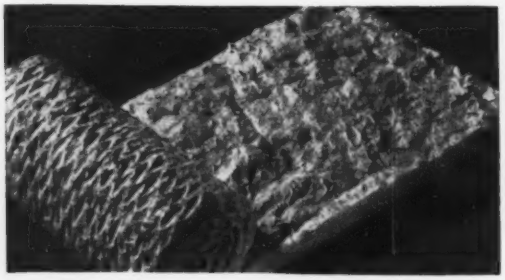
Proven glass technology plus now devoted to early production



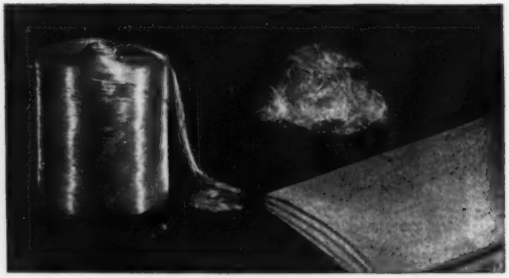
Continuous Fiber Textile Yarn—150 series for many uses, such as electrical insulating tape, sleeving, cloth, roving, and paper reinforcement. Glass fibers have enormous tensile strength . . . 1½ million pounds per square inch and higher. High dielectric strength. Withstands temperatures up to 800°F.



Super·Fine "B" Fiber—Splendid thermal- and sound-insulating qualities. Fiber diameter, .00012". Temperature range –0°F. to plus 450°F. Standard roll widths, 18", 24", 36", 72", in 100' and 200' lengths. Other widths and lengths also available in a range of thicknesses and densities.

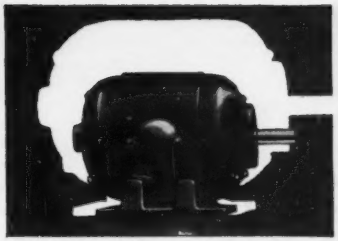


Super·Fine "AA" Fiber—primarily for aircraft insulation. Thickness, .5" with density of .6 lb. per cu. ft. Fibers of incredibly small diameter—.00004". With plastic binder to hold dimensional form. Roll widths, 36", 72", in 50' standard length.

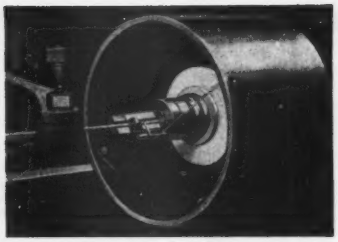


Roving, Chopped Strand and Textile Yarns—for reinforcing of plastics, paper, cloth and paper tape, etc. Enormous tensile strength. Won't shrink or stretch. Won't deteriorate under normal conditions. Versatile in application.

Industrial fabrics woven from Fiber·Glass are fine, safe, strong, rot- and mildew-proof. Ideal applications are tarpaulins, flame shields, airplane cloth, reinforcement for plastics.



Electric motors and generators insulated with L·O·F Fiber·Glass withstand heavy overloads. Appreciable space factor advantages! High dielectric strength.



Wire and cable can be served directly with L·O·F Fiber·Glass textile yarns using standard machines. Yarn also ideal for weaving tape, and braiding on wire and into sleeving.

fine, new facilities of L·O·F FIBER·GLASS!

Aviation, automotive, textile and electrical industries first to benefit from new, high-quality source of supply being readied by Libbey•Owens•Ford

HERE IS headline news of *immediate* interest to key men of business and industry.

The resources and advanced technical glass knowledge of Libbey·Owens·Ford are being focused on a new product—L·O·F Fiber·Glass!

With fine, new facilities at Parkersburg, W. Va., placed to serve you quickly, glass technicians of proven ability and experience are getting set to produce top-quality Fiber·Glass products in volume. (See facing page for basic items to be produced. Note above and right for typical applications.)

Across the country, in 24 major cities, L·O·F offices are busy with preparations to give you help on specific uses.

If your company has already discovered the superior qualities of fibrous glass, investigate L·O·F now as a new volume source, worthy of your complete confidence.

If your company now buys other material for electrical insulation, thermal or acoustical insulation, or reinforcing for plastics or paper, L·O·F Fiber·Glass can offer a combination of advantages unmatched by such other materials. This is a chance to benefit from the glass technology and the high standard of quality which you have come to expect from L·O·F!

For technical data, or engineering consultation on Fiber·Glass uses in your business, call your local L·O·F office—or write, wire or phone Libbey·Owens·Ford, Dept. F·G 114, Nicholas Bldg., Toledo 3, Ohio.

Plastic reinforcing, as in this bread tote tray, presents many possibilities with L·O·F Fiber·Glass. Remarkable strength. Won't dent or lose shape. No discoloration of plastic material. Exceptionally long life.

Paper and paper tape reinforced with L·O·F Fiber·Glass can be raised in tensile strength to equal aluminum or even steel! Either Fiber·Glass textile yarns or scrim mesh are suitable. Investigate!

LIBBEY·OWENS·FORD GLASS COMPANY

FIBER·GLASS DIVISION

L O F FIBER·GLASS

FIBER·GLASS

Power plants of Commonwealth design are engineered to keep investment at a minimum and operating efficiency high by close coordination of structural, mechanical and electrical design.

Over 40 years of experience in the technical needs of public utilities gives Commonwealth the ability and know-how to assure efficient, economical service for today's expansion programs. Commonwealth engineers are now engaged on plant addition programs totalling about $90,000,000.

Let us show you how our consulting and design services may contribute to your economy and efficiency of operations. Write for our booklet describing the services of Commonwealth Associates Address: Commonwealth Services Inc., Department A5, 20 Pine Street, New York 5, N.Y.

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COMMONWEALTH SERVICES · INC. AND COMMONWEALTH ASSOCIATES · INC. ENGINEERING SUBSIDIARY

20 PINE STREET NEW YORK 5, N. Y. HANOVER 2-0170
7 HAYES STREET JACKSON, MICH. DIAL 8121
1025 CONNECTICUT AVE. N.W. WASHINGTON 6, D.C. STERLING 3363

ABILITY · EXPERIENCE · RESOURCEFULNESS · RESULTS

1×10^{-5} litter-microns of hydroger per second.

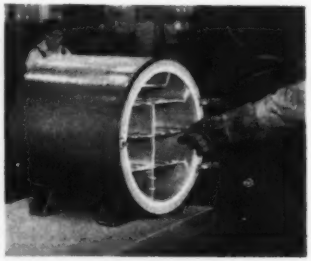
In addition to its usefulness in the manufacture of x-ray and vacuum tubes this unit should prove useful in locating leaks in vacuum stills, vacuum furnaces, refrigeration equipment etc.

Radio Corporation of America, Camden, N. J.

•

Welding Electrode Oven

Protection against moisture absorption by mineral-coated electrodes is provided by this electrode oven. Oven is a portable heated storage unit which controls moisture content to within 0.2%, the accepted standard, at point of electrode use.



Oven heated by 840 watt element operating on either 110 or 220 volts ac. Variable thermostat gives close control up to 600 F. Capacity for 350 lb of electrodes is provided.

Philip Roden Co, 1721 E. Lake Bluff Blvd, Milwaukee 11, Wisc.

•

Packaged Dimmers

Assemblies of the 2000 watt Powerstat dimmers are now available in packages of 3 to 6 units.

Individual dimmers are operated by vertical hand levers with graduated drums. Levers can be interlocked for master control from one lever.

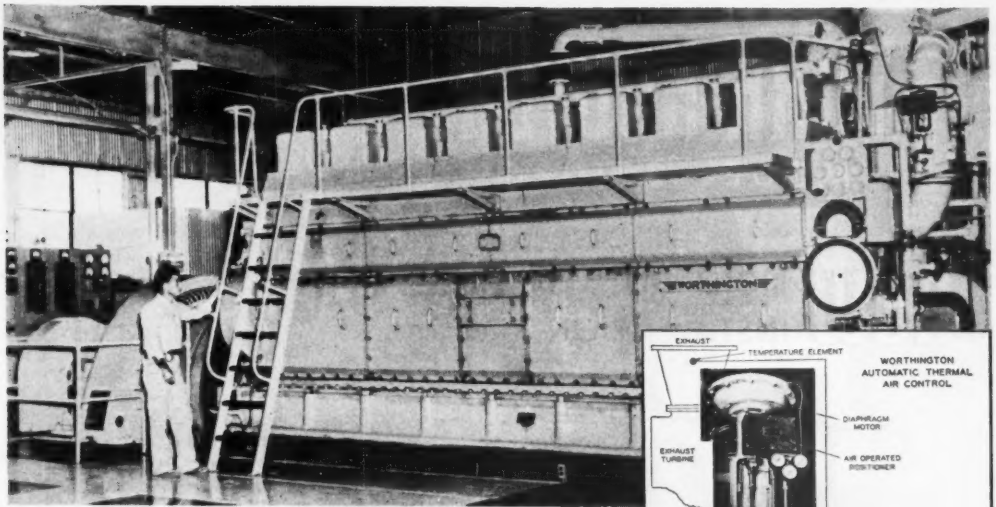
Each unit has an on-off switch and circuit breaker.

Superior Electric Co, Bristol, Conn.

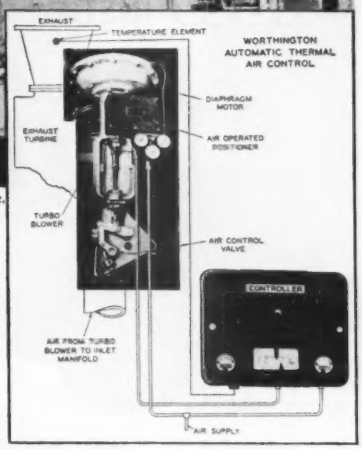
•

Key Operated Selector Switch

Recent addition to the Square D line of oil tight control units is the Class 9001 type TSK key operated selector switch. The unit is available as a two or three position switch with



Worthington supercharged Dual Fuel Engine at Casa Grande generation station of Arizona Edison Co., Inc.



On natural gas or oil...

This Dual Fuel Engine Makes Low-Cost Power at Casa Grande

Casa Grande, near Phoenix, is one of the more important power stations in the Arizona Edison Company system.

Although natural gas is plentiful and nearby, the station is equipped with a Worthington Dual Fuel Engine, which can change over to oil instantaneously.

That's so the type of fuel used can be determined day to day, depending on costs and availability. There are no switchover shutdowns.

This installation is just *another* illustration of the fact that Worthington has the right engine for *any* local condition—proof that Worthington can always help you increase efficiency and lower power production costs. For further information, write Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.

THIS CONTROL CUTS FUEL CONSUMPTION FOR BEST ENGINE PERFORMANCE

The Worthington Automatic Thermal Air Control maintains optimum air-fuel ratio at all times. Result: better engine performance with lower fuel consumption at all engine loads.

This control is used exclusively by Worthington on super-charged dual-fuel engines. It is actuated by the exhaust temperature. Provides automatic variation of air quantity in direct relation to ambient air temperatures. Automatically compensates for changes in heating values of gas fuel. No other type of automatic controller offers these features.

Other exclusive features include dual plunger fuel oil injection pumps and micro-metering gas valves on each cylinder. They are further assurance of better, more economical operation of Worthington Dual Fuel Engines under all load conditions and with varying qualities of gas and fuel oils.

WORTHINGTON

ENGINES

E.1.6

ECONOMICAL CONTINUOUS POWER

Diesel Engines, 150 to 2640 hp
Gas Engines, 190 to 2880 hp
Dual Fuel Engines, 345 to 2640 hp

WORTHINGTON-BUILT AUXILIARIES

Engine Starting Compressors

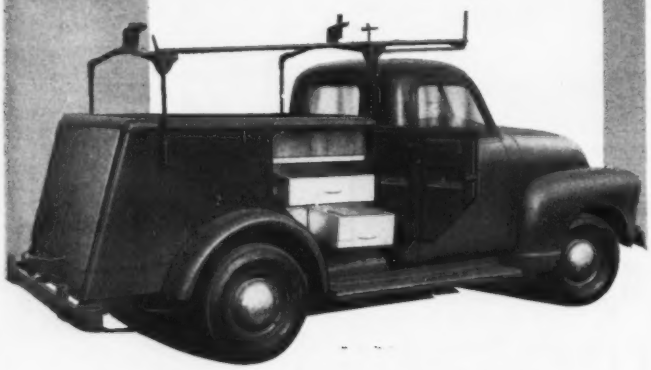
Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Coolers

YORK-HOOVER
MODEL 201U76

new LIGHT DUTY SERVICE INSTALLATION BODY



WHAT THE MODEL 201U76 BODY WILL DO FOR YOU...

Light duty service work must be fast and efficient. Materials and tools must be readily accessible. That is why the new York-Hoover Model 201U76 Body was designed . . . especially for **your** light duty service work . . . for **your** convenience . . . for **quicker, better service.** Efficient design and sturdy construction, combine to provide this **faster, better service** for you . . . at **less** cost.

Write us today regarding your light duty service problems. We will be glad to provide you with all the details, including earliest possible delivery dates of the Model 201U76.

Bulletin No. 930 contains all the facts about our Model 201U76 Body. Write for **your** copy today!

York-Hoover Corporation
YORK, PENNSYLVANIA
Body Division

a variety of cams and contact blocks.

Every possible combination of key withdrawal (locking) positions for two and three position selector switch is available.

Square D Co, 4041 North Richards St, Milwaukee 12, Wis.

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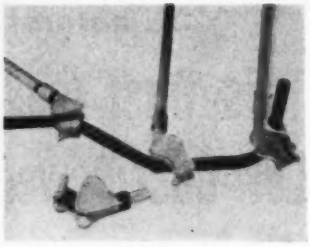

Conduit Bender

Six bending jaws of the Tal-6-Way Hickey permits electricians to make bends, elbows, sets, offsets, loops, saddles, and stubs on open or slab work in close quarters.

Stub hole bends or straightens conduit protruding from walls or floors. **Tal Bender Inc, Milwaukee 2, Wis.**

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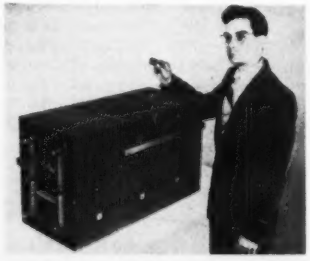


50 Kw Selenium Rectifier

Custom-made high current and high voltage selenium rectifiers are now available.

A vacuum process used in the man-

Basal spraying with Esteron 245.

Cut stumps are sprayed to prevent resprouting.

BASAL BARK SPRAYING . . . *Controls Trees and Brush!*

Spraying the basal portions of trees and brush with Esteron 245 in diesel oil or kerosene is an important new phase of maintenance work. This effective new technique—wetting thoroughly (completely encircling) the base of the stem or trunk to a height of 18 to 24 inches from the ground line—controls most woody species. Spraying may be done *any month in the year*, and may be used in addition to your regular foliage spraying program.

Esteron 245 contains powerful new low-volatility propylene glycol butyl ether esters of 2,4,5-T. The oil carrier penetrates the outer bark—the chemical reaches the plant tissue where the kill is accomplished. For woody stands in leaf—Esteron Brush Killer containing low-volatility esters of 2,4,5-T and 2,4-D does an effective control job.

Both Esteron 245 and Esteron Brush Killer are useful also for spraying cut stumps to prevent resprouting. This, too, may be done at any time during the year. The complete stump must be wet to the ground line, including all exposed bark and above-ground roots.

Dow has worked extensively over a period of many years with leading service organizations engaged in spraying right-of-ways with Dow weed, brush and grass killers. Our sales and technical men are available for consultation and assistance. Write your nearest Dow sales office.

ESTERON 245 and ESTERON BRUSH KILLER

CONTAINING NEW LOW-VOLATILITY ESTERS

THE DOW CHEMICAL COMPANY

Agricultural Chemical Department • Midland, Michigan

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

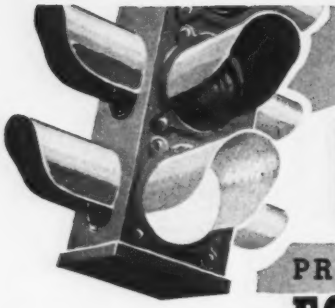
USE DEPENDABLE DOW AGRICULTURAL CHEMICAL PRODUCTS

WEED, BRUSH AND GRASS KILLERS • INSECTICIDES
FUNGICIDES • PLANT GROWTH REGULATORS
GRAIN AND SOIL FUMIGANTS • WOOD PRESERVATIVE

DOW

CHEMICALS

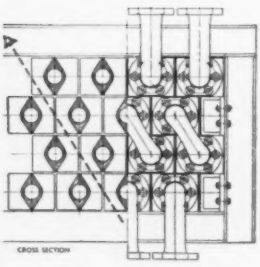
INDISPENSABLE TO INDUSTRY AND AGRICULTURE



GREEN

PREMIER DIAMOND ECONOMIZERS

The Economizer with the "Diamond" Design



Here are the four major values in the "diamond" shape of the Green Fuel Economizer:

1... Streamline flow of flue gases gives minimum draft loss

2... Finned tubes give maximum heating surface in given space

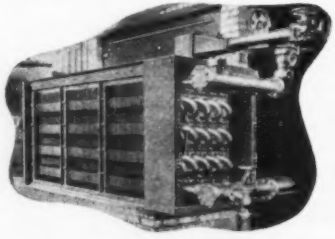
3... Staggered tube arrangement permits easy inspection

4... Minimum soot collecting surface is thoroughly cleaned by Green's "Special" Soot Blowers

Green Premier Diamond Economizers are available in either cast iron tube construction (Type 25) or steel tube construction (Type 12).

Pressure parts are rugged and joint flanges independent of support flanges.

Green Fuel Economizer's reputation of 60 years assures you of satisfactory performance and quality. Send for Bulletin No. 169.



THE GREEN *Fuel Economizer* COMPANY INC.

BEACON 3, NEW YORK

ECONOMIZERS • FANS • AIR HEATERS • CINDERTRAPS

ufacture of these units makes possible production of larger cells by permitting thicker deposits of selenium. **Syntron Co, Homer City, Pa.**

MORE NEW PRODUCTS about which you should know

Square Tool and Dye Co, 1550 N. Fremont St, Chicago, Ill., has developed a **self-locking sleeve bolt fastener.** Eliminating nut of conventional bolt and nut, it reduces labor costs. . . . . Marman Products Co, Inc, of Inglewood, Calif., has perfected a new **panel instrument mounting clamp** allowing removal of instrument from dial side of panel.

General Electric Co, Schenectady, N. Y., has **redsigned three slimline fluorescent lamp ballasts.** Company engineers claim new units to be appreciably smaller in size, lighter in weight, and improved in sound ratings. . . . . Riverside Metal Co, Riverside, N. J., has announced a **spring balanced, solenoid operated indicating card** for use by equipment operators. Card assures operators of mechanical relationships, settings, and positions not accessible for inspection.

Westinghouse Electric Corp, Pittsburgh 30, Pa., announces type AB, 225a, **K-frame breaker with improved motor operated mechanism.** Motor mechanism is removable and replaceable without affecting relation between operating mechanism and breaker. . . . . Arrow-Hart & Hegeman Electric Co, of Hartford, Conn., has developed a lighter weight, smaller, Explo-Safe **weatherproof magnetic starter.** Featured are Feraloy housing, straight-thru wiring, and "Right Angle" type of mechanism.

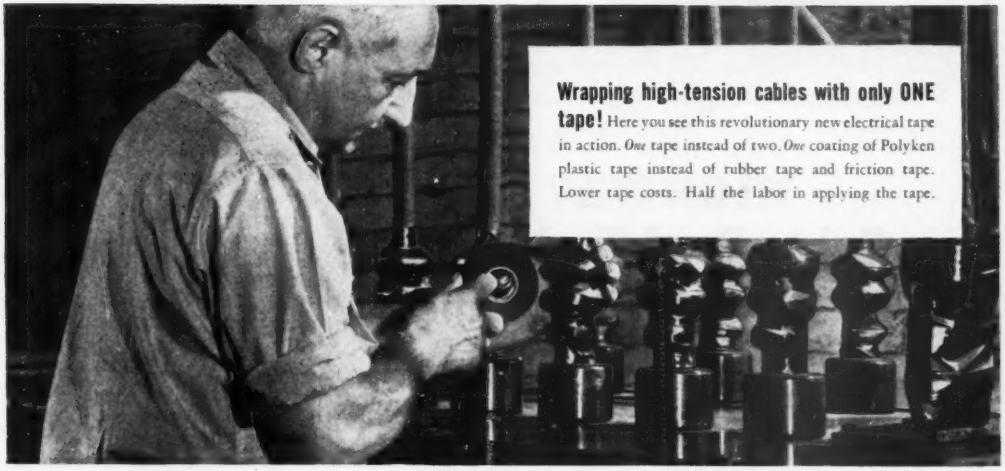
Reliable Electric Co, Chicago, Ill., has released **new spacer type, two bolt connectors** for sizes ranging from 2/0 to 2/0 and 4/0 to 4/0. A "full length" spacer is used to provide full contact area for carrying full load current conductor. . . . . Irvington Varnish & Insulator Co, Irvington 11, N. J. announces the use of Teflon Coated Fiberglass for meeting Class "H" requirements for high temperature operation. New material has excellent electrical properties, mechanical strength, and extreme chemical inertness.

THE NEW

Polyken®

INDUSTRIAL TAPES

TAILORED TO YOUR JOB



Wrapping high-tension cables with only ONE tape! Here you see this revolutionary new electrical tape in action. *One* tape instead of two. *One* coating of Polyken plastic tape instead of rubber tape and friction tape. Lower tape costs. Half the labor in applying the tape.

Costs CUT IN HALF with new tape

Splice with one tape instead of two

Until Polyken No. 822 was developed, wrapping high-tension cables was a two-step job. First, a rubber splicing compound, followed by an outer wrap of friction tape.

Now you can forget the rubber compound! Polyken Electrical Tape No. 822 is only 9 mils thick—but it's 10,000 volts strong (dielectric strength). Makes *one* quick operation out of two tedious ones—and provides better protection.

No. 822 is the only oriented polyethylene tape with a successful pressure-sensitive adhesive. Stretches both ways, so that it covers rough and irregular surfaces. High moisture resistance. Solvent proof. Corrosion proof. For splicing, wrapping, insulating, corrosion coating of cables, wires, controls, pipes, conduits, and hundreds of other uses. Write for free samples today!

Polyken, Dept. EWK-1, 222 West Adams St., Chicago 6, Ill.

For specifications, samples, and further information on this and other Polyken tapes, please send me your *FREE BOOKLET*, "Tape is a Tool."

Name_____ Title_____

Company_____

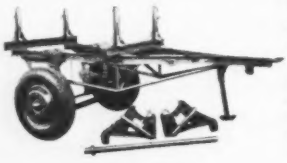
Street Address_____

City_____ Zone____ State_____

Polyken **Industrial Tape, Department of Bauer & Black, Division of The Kendall Company**

HIGHWAY
Cable Reel Trailers
Quick loading - Easy riding

This is one model from the complete line of Highway Utility Trailer Equipment and accessories. It is used by utility companies all over the country for loading and transporting heavy and unwieldy reels of cable. It is quick and simple to load. Has a low center of gravity for safe transportation and braking at high speeds. There are two models with adjustable saddle guides to accommodate reels from 34" to 48" in width. Comes equipped with safety ropes and attaching parts. See your Highway representative for full information, or call or write for complete catalog.



COMBINATION POLE, CABLE REEL TRAILER

Quickly adjustable for either poles or cable reels. For poles, bolsters with sliding cam locking stanchions are easily mounted or unmounted. Cable reel saddles can be securely attached in a minute or two. Carries cable reels as effectively as standard cable reel trailer. Adjustable to different reel widths.

POLE TRAILER

This well-known Highway trailer has the strength to carry the occasional heavy load of poles while it is light in weight for economical carrying of average loads of poles. Load binding winch mounted on rear cross member, king pole binder on front cross member, 4 cam lock sliding stanchions make for safe transportation.

HIGHWAY TRAILER COMPANY

Headquarters: Edgerton, Wisconsin
PLANTS AT EDGERTON, WISCONSIN — STOUGHTON, WISCONSIN
CINCINNATI, OHIO

Manufacturers of Utility Truck Bodies • Earth Boring Machines • Pole and Cable Reel Trailers • Winches • Power Take-offs • Service Accessories

WHAT THEY'RE SAYING
at industry meetings

Suggestions for Utilities

James F. Fairman, *administrator, Defense Electric Power Administration, at the convention of the Maryland Utilities Assn, Virginia Beach, Va.*

Looking at the utility situation over the past few months from a national point of view, I have drawn these conclusions:

1. Your utility programs as now planned are prudent, realistic and well conceived.

2. You should inform the public of your own individual programs and of the importance of your programs to mobilization for defense.

3. Utility management must not adopt an ostrich-like attitude when it sees trouble ahead. How can the policy makers make necessary adjustments for the industry unless they have real facts?

4. If you have not already done so, put your own company on a voluntary basis of full cooperation with known conservation measures. Many opportunities exist for reducing use of critical materials and for putting more scrap into national metal channels. It is absolutely essential to coordinate equipment deliveries with construction so that the entire industry may benefit from available supplies.

5. Do what is necessary to alert your organizations to the fact that America cannot step up its productivity unless its people work harder and longer. Utilities will not fulfill their obligations to their customers unless every employee makes a contribution which is just a little beyond the call of duty.

Growth of Electronics

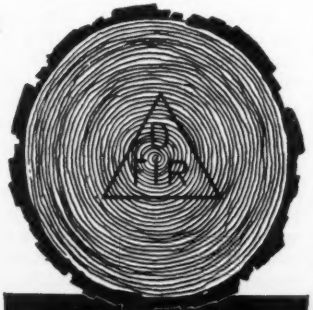
Dr Allen B. DuMont, *president, A. B. DuMont Laboratories, Inc, before the 87th Annual Convention of Theta Xi fraternity, Pittsburgh.*

Electronics production has increased 300% in the last six months and another 300% increase is expected in the last half of the year. More than $7.6 billion will have been awarded for electronics contracts by the end of the current fiscal year. This figure is three-fourths as great as electronics

FOR LONG LIFE and low service cost, the big 3 in western poles are Western Larch — Lodgepole Pine — Douglas Fir.

All 3 are grown on the virgin forest lands of the J. Neils Lumber Company in western Montana. All 3 are produced and treated in J. Neils modern pole plant at Libby, Montana.

J. Neils Lumber Company, since 1895 a quality manufacturer of forest products, invites your inquiry on transmission and telephone poles. An illustrated folder on J. Neils treated poles, and information regarding their application to your own requirements, will be furnished on request.



POLE DIVISION

J. Neils Lumber Company

Libby, Montana

Don't Let Fire Destroy What Can't Be Replaced for Many Months

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Originated

LOW PRESSURE CO_2 SYSTEMS*

to Lick Tough Fire Problems

Low Pressure Carbon Dioxide fire extinguishing systems were researched, pioneered, perfected and patented by CARDOX.

Thousands of installations have been made in the nation's leading corporations.

First installation was made in 1939.

Approved by Underwriters' Laboratories, 1940-1941 — Factory Mutual Laboratories 1942.

● Today, when equipment is so hard to replace, it is worth remembering that the first CARDOX System ever built was built for a power station. Since then there have been scores of others, until today 14 of the nation's 25 largest power generating systems depend upon CARDOX Systems and Equipment for fire protection.

CARDOX *pioneered* low pressure carbon dioxide systems to protect hazards for which no existing protection was fully adequate. Millions of dollars in research — decades of experience condensed by high priority projects into a dozen years — have helped CARDOX to save utility plants from crippling fire damage.

CARDOX Low Pressure CO_2, applied as easily in tons as in pounds, extinguishes fires often uncontrollable by other means. It causes no extinguishment damage — can readily protect all the critical hazards in your power station.

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CARDOX CORPORATION

**Cardox Low Pressure Carbon Dioxide Systems and Equipment are covered by U.S. and Foreign patents issued and pending.*

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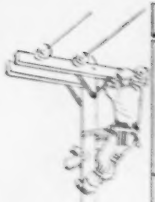

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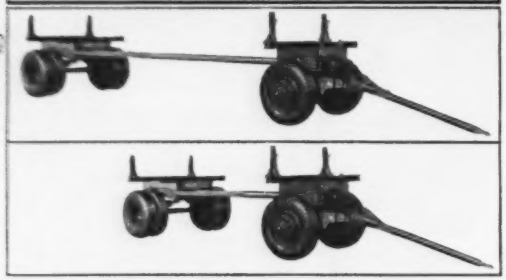

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Extend or shorten the wheel base of this heavy duty pole trailer, easily and quickly, by means of the telescoping center pole. Trails smoothly—without "snaking" or "weaving." Fully reinforced—a big trailer that does a big job. Full 90° turn front dolly—either direction—5th wheel type steer. 9 tons capacity; over-all length extended, including tongue, 54 ft. 2 inches; telescoped 36 ft. 4 inches. Extended wheel base 40 ft. 3 inches; telescoped wheel base 22 ft. 5 inches. Equipped with electric brakes on rear wheels. Send for complete information on Model 6450—Eagle Telescoping Pole Trailer.

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For power distribution jobs. Available in eight sizes to cover range of cable No. 8 solid to 1,000 MCM.

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H2L-2

H3L-2

HC

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contracts let during all of World War II.

Concerning sales of television receivers, there will be an upturn in October and November. A normal Christmas season can be anticipated by the nation's set makers. However, restrictions on materials will cut receiver production during the last quarter on the year to an estimated 940,000 sets. This compares with an approximate 2 million sets produced during the first quarter of 1951.

Atomic Power Research

Dr. C. G. Suits, *vice president and director of research, General Electric Co. at the third annual Oak Ridge Summer Symposium, Oak Ridge, Tenn.*

Plutonium now being used for atomic arms has only two known uses—bombs and production of electric power. Use of nuclear fuel for electric power generation seems to be the only means of salvaging atomic war material.

In view of the vast national effort being poured into the atomic bomb industry at present, some small fraction of this effort should be allocated to power plant research as a hedge against the final obsolescence of atomic bombs when the real peace has been attained.

Clean Luminaires Regularly

C. E. Egeler and R. F. Vanden Boom, *engineers, Lamp Division, General Electric Co, at the National Technical Conference of the Illuminating Engineering Society, Washington, D. C.*

Most plant maintenance forces are not aware that irregular cleaning of fixtures may mean a light loss of as much as 50%. Recent studies indicate that dirt on lamps alone can account for an average light loss of 19%, while dirt on reflectors can reduce delivered light by 28%.

A lighting maintenance program is a sound investment. In an engine assembly plant a systematic cleaning of industrial 2-lamp, 40-w fluorescent fixtures was done for an additional operating cost of only 9%. An investment of 70 cents per fixture yielded a $3.40 return in additional illumination. By coordinating group replacement of lamps with the cleaning schedule, reduction in lamp replacement labor cost usually offsets the added lamp cleaning cost.

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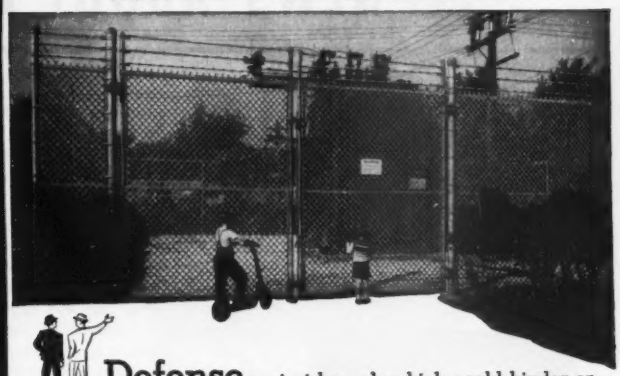

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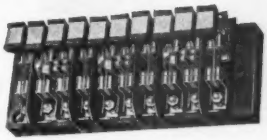

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NEWS ABOUT PEOPLE

General Electric Elects Belanger, DuChemin VPs

John W. Belanger and Nicholas M. DuChemin have been elected vice presidents of General Electric Co. Belanger, who has been general manager of the company's Large Apparatus Division, will serve as general manager of the newly created Defense Products Division. DuChemin recently was named manager of the Manufacturing Services Division.

J. W. BELANGER

N. M. DUCHEMIN

Belanger began his career with GE in 1917 as a student engineer on the company's test course at the Lynn, Mass., Works. Later he held positions in the Power and Mining Department in Schenectady in the arc welding field, as an arc welding specialist in the Philadelphia sales office, as a salesman contacting steel mills and oil refineries in the Philadelphia office industrial department, and in 1930 as head of marine sales, Philadelphia district.

Returning to Schenectady in 1940, Belanger became assistant manager of the Federal and Marine Divisions and three years later was made manager of these divisions. He was appointed assistant sales manager of the Apparatus Department in 1945, manager of the Turbine Divisions in 1947, and assistant general manager of the Apparatus Department in 1949. Last January he was named general manager of the Large Apparatus Division.

DuChemin joined GE in 1914 at the Lynn River Works and returned there after two years service during World War I to work in the turbine department. He was made general superintendent of the West Lynn Works in 1923, making him one of the youngest executives in the company.

In 1935 DuChemin was named assistant works manager and became acting manager in 1942 and works manager a year later. He was appointed manager of the Meter and Instrument Divisions in 1947 and assistant general manager of the Apparatus Department in 1949. DuChemin served as general manager of the Small Apparatus Division from January, 1951, until last month when he was put in charge of the Manufacturing Services Division.

•

Duane L. Kenaga has joined the wood preservation laboratory of Dow Chemical Co. For the past three years Kenaga has been engaged in research at Southern Research Institute, Birmingham, Ala.

J. W. Wyatt, sales manager for Louisiana Power & Light Co's north Louisiana service area, has been appointed assistant division manager for the utility's west bank division. **E. A. Hodge** of the general office sales staff replaces Wyatt as north Louisiana sales manager.

De Luccia Elected VP by Pacific Power & Light

E. Robert de Luccia, manager and chief engineer of Pacific Power & Light Co's Yale hydroelectric project on the Lewis River in Washington, has been elected a vice president of the company (EW, Oct. 1, p 3).

E. R. DE LUCCIA

The utility also named H. W. Millay secretary to succeed J. G. Hawkins, who is retiring after 42 years of service.

De Luccia resigned as chief of the Federal Power Commission's Bureau of Power earlier this year to become chief engineer of Pacific P&L's $26.5-million hydro project. He joined FPC in 1938 and organized the Bureau of Power on his return from Army service in 1945. Previously de Luccia worked for Stone & Webster and the War Department.

Millay started with Pacific P&L in 1925 as a meter reader in Lewiston, Idaho. He transferred to Portland, Ore., in 1930 and since has filled various posts including assistant treasurer, budget director, and assistant secretary.

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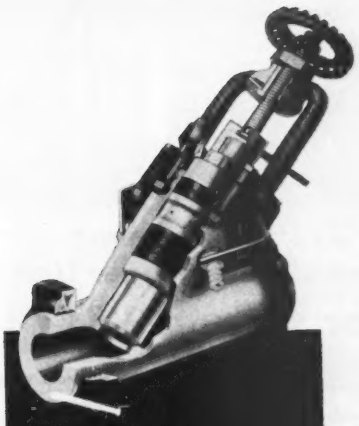
Joseph P. Minnich, general manager of power sales for New York State Electric & Gas Corp, has been appointed general manager of utilization. In addition to his present duties, Minnich will be responsible for all



THIS IS A CHEMICAL PORCELAIN VALVE

IN many chemical processing industries, the corrosive nature of acids and other solutions used is such that stainless or other alloys, rubber, plastic, glass or other traditional corrosion-resistant materials are inadequate. Porcelain vessels have long been used as the standard of purity in laboratory work. Because of the demand for "laboratory purity in industrial production," Lapp, more than 15 years ago, got into the chemical porcelain business.

Among Lapp products used in the chemical industry are valves such as this one. It has a solid porcelain body, solid porcelain stem and solid porcelain packing rings. Parts are individually ground, and lapped together for pressure-tight long-lasting fit. Thousands of these valves, and miles of corresponding Lapp porcelain pipe, are now in service, most of them in systems where "equipment of no other material has ever served satisfactorily."

The properties of Lapp porcelain, in addition to its inherent chemical stability, which make possible such a valve—and such performance—are its complete non-porosity, its dense, fine-grained *strong* body, its freedom from internal impurities or imperfections.

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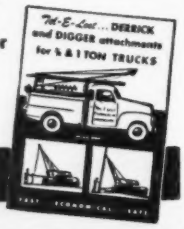
New "325" Attachment
. . . Derrick and Digger Unit
For 3/4 and 1-TON TRUCKS

Why send a five man truck and crew on pole replacement or service jobs that can now be handled by two men and a highly portable ¾ or one ton service truck? The "325" attachment makes it possible for two men to set up the derrick, attach the digger, dig the hole and set the pole ready for tamping *in less than ten minutes!* This set-up, with or without radio communication, speeds up line work and cuts costs way down.

★ No more using five-man crews on two-man jobs

★ Sets poles up to 35'; take augers 8" to 20" diameter

★ Packaged unit for installation by your local mechanic



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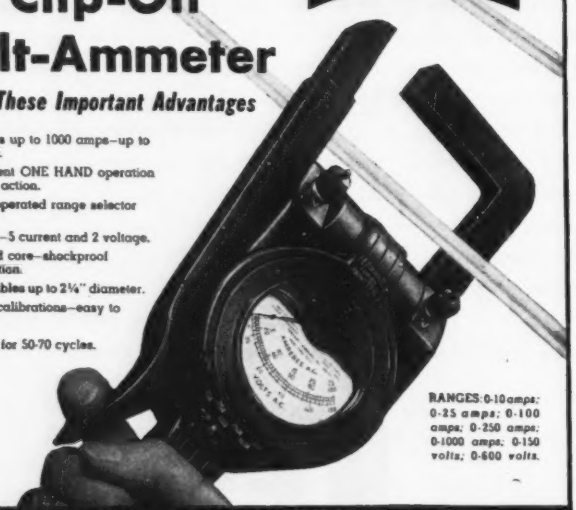

RANGES: 0-10 *amps;* 0-25 *amps;* 0-100 *amps;* 0-250 *amps;* 0-1000 *amps;* 0-150 *volts;* 0-600 *volts.*

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aspects of utilization of company service by industrial customers and public authorities, including street lighting service. He also will handle the company's power contractual relations with other utilities. **Leonard P. Fries,** assistant power sales manager, has been advanced to manager of power sales and **Henry H. Goss,** street lighting engineer, has been appointed manager of street lighting sales. Both will report to Minnich.

•

Districts Reorganized by New Jersey P&L Co

New Jersey Power & Light Co has reorganized its district and engineering departments. The eastern and central districts have been combined into an eastern division and the western and southern districts have been formed into a western division.

As a result of the changes the utility has named John H. Miller manager of the eastern division and Earl G. Packman manager of the Bernardsville area, which has been organized as a district. The western division will be headed by Walter E. Gess with Harold S. Du Bois taking charge of a new operating district in the Washton area.

New engineering appointments include Robert E. Kiefer of the central engineering department as general distribution engineer; James H. Sprecher as eastern division engineer, assisted by Melvin I. Unger and J. Luther Miller; and Samuel A. Mitterling as western division engineer, assisted by Robert E. Dudley and George W. Blount. Kiefer will supervise the planning and co-ordination of all distribution engineering.

•

Paul W. Arnold and **Richard A. Geuder** of Reliance Electric & Engineering Co have been appointed executive assistant to the sales vice president and manager of applied engineering and industry sales respectively. Arnold has been manager of product sales for the company and Geuder has been directing application engineering work.

G. G. Keogh has been appointed manager of employee and plant community relations for the Locke Department of General Electric Co. He has been materials manager for the department. Keogh started his career

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IN JUNE of 1887 it cost extra to ride in a train fully equipped with electric lights. That's when the Pennsylvania Railroad placed the first fully electrically lighted train in service . . . the Pennsylvania Limited between Chicago and New York.

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It's Clean! • It's Certain!

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First, you'll notice that a PENTA-protected pole is clean—easy on the hands and clothes. PENTA permits full-length preservative treatment with no fear of complaint from your customers or line crews.

Then, when you examine a pole and cross-arms that have been in service for a number of years, you'll see how well the PENTA treatment has done its job of protection. No signs of ground line decay, shell rot, top rot, or insect damage.

PENTAchlorophenol is a powerful, stable and uniform wood preservative —allows measured and positive protection. It penetrates deeply and will not leach out. Doesn't affect conductivity, creates no special problems.

Specify PENTA treatment for safeguarding your poles, cross-arms and other wood construction. Write us for complete facts and convincing data.

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with GE in 1921 as a stock record clerk in Baltimore. He later worked in the company's switchgear and power circuit breaker divisions. Assigned to Locke in 1945 as production manager, Keogh later become plant superintendent and then materials manager.

Alfred E. Treen has been made manager of personnel and purchasing at the Houston Works of A. O. Smith Corp succeeding **F. B. Dunn,** who has resigned. Treen has been with A. O. Smith's personnel administration staff since 1946. Previously he had worked for U. S. Steel Corp.

James B. Ferguson, consulting engineer for Link Radio Corp, New York, has been appointed chief engineer of the company. He came to Link Radio in 1950. Named to assist Ferguson were **Frederick A. Schaner, Harold M. Heimark,** and **J. W. Campbell.**

M. P. Kartalia has been named manager of merchandise sales of Square D Co. He will retain his present duties of manager of distribution equipment sales.

Westinghouse Promotes Miller, London, Others

Westinghouse Electric Corp has named C. W. Miller manager of large power transformer engineering for the Transformer Division at Sharon, Pa. Section manager in charge of the shell form section of the division since 1949, he succeeds the late W. G. James.

The company also has announced the appointment of Coleman London as manager of electronics service of the Electronics and X-ray Division, and George E. Grosser as consulting and application engineering supervisor for the Middle Atlantic District.

In the Lamp Division Harry A. Holden has been made manager of the company's new plant at Paris, Tex., and will be succeeded as manager of the Belleville, N. J., lamp base and electronic tube plant by Harry F. Fox. In another appointment, William C. Kappler was named superintendent of miniature lamp manufacturing.

Miller joined Westinghouse's Transformer Division Engineering Department in 1929 and in 1948 became supervising engineer in the large power transformer section.

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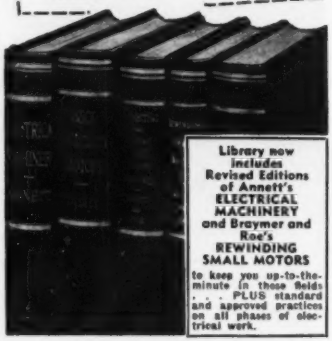
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Includes trouble-shooting book

In addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a handy book giving helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc.

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In his new position London will direct the activities of a national and overseas field service organization for military and commercial electronics equipment manufactured at the company's plant in Baltimore. With Westinghouse since 1938, London has held drafting, laboratory, and design engineering positions on government radar projects. Appointed section engineering manager five years ago, he has been responsible for the engineering development of commercial marine radar, railroad radio equipment, and specialized communication.

Grosser has served Westinghouse in various capacities since joining the company in 1922. Since 1939 he has been a switchgear specialist.

Holden will make his headquarters at Bloomfield, N. J., until the Paris plant starts production at the end of this year. Starting as an apprentice toolmaker in 1929 with Westinghouse, Holden later became master mechanic in the wire products department of the Lamp Division and then superintendent and manager of the Belleville plant. Fox joined the company in 1928 as a machine apprentice and has served as a junior engineer in the electronic tube manufacturing department, superintendent of tube manufacturing, and assistant manager at Belleville.

General foreman of the company's miniature lamp manufacturing department at Bloomfield, N. J., since 1949, Kappler joined Westinghouse in 1942 in its Merchant Marine Division, Lester, Pa. He transferred to Bloomfield in 1945 when the Merchant Marine Division was closed.

•

Gordon L. Robertson has been appointed Clanton, Ala., district manager for Alabama Power Co. He joined the company in 1923 as an electrical engineer and has served as district manager at Greenville.

OBITUARY

Murray Calder Hendry, hydraulic engineer with the Hydro-Electric Power Commission of Ontario until he retired two months ago, died Sept. 21 at Toronto. Hendry was responsible for early surveys of the St. Lawrence River and was keenly interested in the seaway project.

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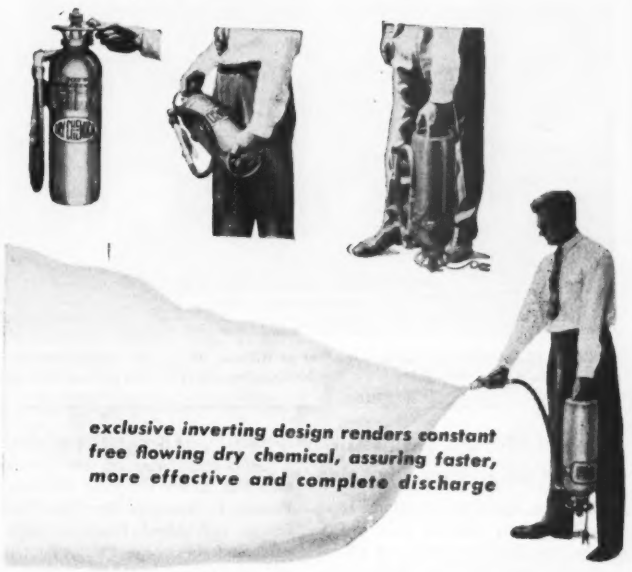
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These fast, positive fire killers are easy to operate, compact, well-balanced and offer extensive maneuverability indoors or outdoors . . . no extra gadgets protruding or complicated operating parts. The outstanding mechanical breakage feature of C-O-TWO Dry Chemical Type Fire Extinguishers, plus continuous inert gas pressured agitation or fluffing, together with a skillfully blended free flowing dry chemical, guarantee lasting, foolproof fire protection. All sizes are rechargeable on-the-scene by anyone . . . no special tools required.

C-O-TWO Dry Chemical is a finely pulverized powder . . . non-conducting, non-corrosive, non-abrasive, non-freezing and non-toxic . . . special compound consists of sodium bicarbonate and other chemicals skillfully blended to render high fire extinguishing qualities, remain free flowing while being used and withstand long periods of storage without deterioration. When brought into contact with fire, C-O-TWO Dry Chemical absorbs a greater part of the heat, decomposes and releases fire killing gases. This heat absorption process acts as an insulating screen between the fire and the fire fighter.

Fully approved and built to rigid specifications . . . C-O-TWO Dry Chemical Type Fire Extinguishers are exceedingly effective on flammable liquid, gas and electrical fires, as well as surface fires involving ordinary combustible materials . . . rated by Underwriters' Laboratories, Inc. and Factory Mutual Laboratories for class B and C fires.

Convenient 4, 20 and 30 pound hand sizes . . . no syphon tubes or valves within the cylinder to become clogged or inoperative . . . discharge hose and squeeze type discharge nozzle remain empty until actuation takes place . . . one piece removable top assembly.

Also, convenient 150 pound wheeled size . . . sturdy, wide-faced wheels . . . discharge hose and two position discharge nozzle having soft or solid stream fully enclosed in protection casing . . . footrail and dual bar handle provide easy inverting.

Act now for complete free information on these top quality fire extinguishers. Remember . . . you can't put fire off . . . fire doesn't wait. Get all the pertinent facts . . . write today!

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Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

MANUFACTURERS and MARKETS

MARCUS TRANSFORMER CO's new plant at Hillside, N. J., will enable firm to increase production of transformers 50%. Building has about 10,000 sq ft of floor space

General Electric Forms 6 New Operating Divisions

Six new operating divisions have been formed by General Electric Co.

The new divisions include the Turbine Division and the Motor and Generator Division, both with headquarters at Schenectady, N. Y.; Transformer and Allied Products Division, Pittsfield, Mass.; Measurements and Industrial Products Division, Lynn, Mass.; Switchgear and Control Division, Philadelphia; and Component Products Division, Ft. Wayne, Ind.

Together with the recently formed Defense Products Division, the six new divisions include the majority of the departments which constituted the former Large Apparatus Division and Small Apparatus Division.

Glenn B. Warren has been named general manager of the Turbine Division, which includes the Large Steam Turbine and Generator Department, Gas Turbine Department, Medium Steam Turbine, Generator, and Gear Department, Small Turbine and Supercharger Department, Foundry Department, and Schenectady Works Laboratory.

The Motor and Generator Division will be headed by James M. Crawford. The division includes the Large Motor and Generator Department, Small and Medium Motor Department, and Schenectady Works Service Department.

General manager of the Transformer and Allied Products Division is Francis E. Fairman, Jr. The Transformer and Allied Products Department and the Locke Department are included in this division.

George E. Burens is general manager of the Switchgear and Control Division, which is made up of the Control and Switchgear Departments.

Named as general manager of the Measurements and Industrial Products Division is Harold E. Strang. The division includes the Meter and Instrument Department, Lighting and Rectifier Department, Industrial Heating Department, Welding Department, and Lynn River Works Service Department.

William C. Wichman is general manager of the Component Products Division, consisting of the Fractional Horsepower Motor Department, Speciality Transformer and Ballast Department, and Ft Wayne Works Service Department.

Metal Prices
Oct. 1, 1951

COPPER, Conn., V., lb	$ .24½
LEAD, N. Y., lb	.19
ZINC, prime Western, E. St. Louis, lb	.19½
TIN, Straits, qual. N. Y., lb	1.03
ALUMINUM, ingot, base price	.19
NICKEL, base price	.56½
STEEL, billets, Pitts., ton	56.00
STEEL, scrap No. 1 heavy, Pitts, ton	45.00

GE, Westinghouse Plan Big Expansion Programs

Expansion programs of close to $750 million are planned by two leading electrical manufacturers. General Electric Co has a $450-million plan for new plants and facilities in the next four years. Westinghouse Electric Corp has announced a $296-million program, largest in its history, extending beyond 1953.

Will Increase Facilities 50%

The Westinghouse program will increase its manufacturing facilities by 50%. In 1948 a $150-million expansion program begun in 1945 was completed.

Projects already undertaken as part of the program include a new electronic equipment plant in Raritan Township, N. J., which will begin production soon; a small motor plant at Union City, Ind., now more than half completed; electronic tube plants at Elmira and Bath, N. Y., and provision for substantial increases in production of household appliances and television sets.

To finance this program Westinghouse plans to sell debt securities. Stockholders will be asked to approve an increase in authorized debt from $150 million to $500 million at a special meeting at East Pittsburgh in December.

Sales Exceed Wartime Peaks

Gwilym A. Price, Westinghouse president, stated that from 1948 to 1950 sales and net income exceeded wartime peaks and that sales during the first half of this year were at a higher rate than during the corresponding period of 1950. He admitted an "indeterminate portion" of this increase was due to higher price levels.

General Electric's planned outlay of $450 million duplicates its capital investment made since 1947 and also that made in the 54 years prior to 1947. It is hoped that no new financing will be necessary, but this possibility was not ruled out.

Since 1947 GE has increased manu-

facturing space from 26 million to 57 million sq ft. A large part is represented by new plants.

Military work accounts for about 20% of GE's present production. This is expected to increase to about 33⅓% by next year, with production of civilian goods being cut to about 50%. Up to now the company has not had to delay deliveries of generating equipment to electric utilities.

•

Allis-Chalmers Develops 'Supercharged' Generator

A new "supercharged" generator which takes 30 to 40% less material than a standard machine of the same rating has been announced by Allis-Chalmers Manufacturing Co. A 60,000-kw machine of the new design has been in operation for two months at the Edgewater Plant of Wisconsin Power & Light Co, Sheboygan. Other machines are under construction.

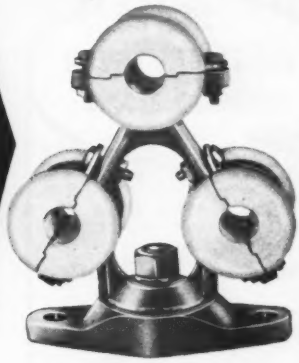
Both weight and length are saved in the new machine by forcing hydrogen over the rotor at a much higher velocity than previously used. In addition to the usual fans for circulating the hydrogen, the new generator has a two-stage centrifugal compressor, mounted at one end of the rotor shaft, supplying gas to the rotor. Also, cooling of the rotor is speeded by specially shaped copper windings through which cool hydrogen travels at high speed. The hydrogen is cooled by conventional water-to-hydrogen heat exchangers.

Test data show that in less than a fiftieth of a second hydrogen passes through the full length of the rotor passages of a 60,000-kw machine and absorbs enough heat to raise its temperature 90 deg.

MANUFACTURING BRIEFS

Television set production this year is estimated at 5.3 million units compared with 7.5 million units in 1950, according to a survey by Television Shares Management Co. In a forecast the company stated the outlook for demand appears to be brighter than recent sales within the industry indicate. Relaxation of credit controls, lower set prices, high and rising consumer income, and the opening of the coast-to-coast network are expected to improve the sales situation.

A RELIABLE WIRING DEVICE



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Three E Clamp Insulator Supports provide a safe and substantial means for supporting insulated conductors.

They can be had for conductors varying from 5/16" to 3½" diameter, and for pipe or flat mounting.

There are standard supports for single conductor, two, three, and four conductors in line, and for three conductor in triangular configuration as illustrated.

The most commonly used sizes are kept in stock for prompt shipment.

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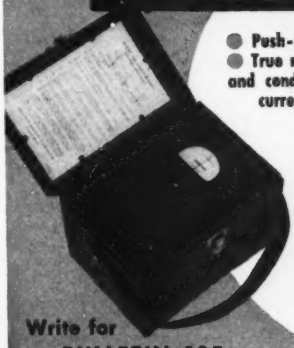

● Push-Button Operation ● Direct-Reading ● True readings, regardless of earth resistance and condition, stray frequencies, voltages or currents. ● Completely Self-Contained

YOU can be sure of safe, effective grounding of all types of electrical systems when you test with the light, easy-to-use Vibroground. Simple operation and built-in accuracy virtually eliminate reading errors. No leveling, cranking or outside power source is necessary; and direct readings are independent of auxiliary probe resistance.

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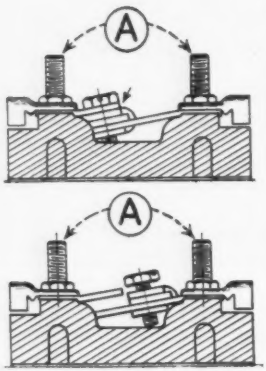

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(2) Slide link out of contact—take reading

(3) Slide link back and bolt in position

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NEW ELECTRICAL CONSTRUCTION

NEW ELECTRICAL construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included

UTILITIES

Proposed Construction

California—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f.o.b. cars shipping point or f.o.b. cars Exeter, Calif., motor-control switchboards and distr. switchboards for Pumping Plants E1 and E2, Exeter Irrigation District, Central Valley Proj., Spec. DS-3548. L. N. McClellan, ch. engr.

Colorado—Bureau Reclamation Dpt. Interior, Bldg. 52, Denver Federal Center, Denver, furnishing, del. f.o.b. cars shipping point or f.o.b. cars Walt Siding and Loveland, Colo., tube valve with control stand, one lot of connecting piping for pump-turbine bypass Flatiron Power and Pumping Plant, Colorado-Big Thompson Proj., Spec. DS-3552. furnishing, del. f.o.b. cars shipping point or f.o.b. cars Loveland, Colo., and Walt Siding, Colo. one main control board and one recording board for Flatiron Power and Pumping Plant, Colorado-Big Thompson Proj., Spec. DS-3549. L. N. McClelland, ch. engr.

Fla., Jacksonville—City, City Hall, constr. 69KV double circuit transmission line between Georgia St. Switching and Talleyrand Ave. Sub-station. Plans deposit $7.50. Reynolds, Smith & Hill, 227 Park St., engrs.

Minn., LeSueur—City, M. G. Kampen, clk., furnish, install dual-fuel diesel generating unit, auxiliary equip. in Municipal Power Plant, maximum of 360 rpm of between 1,400 and 2,000 BHP capacity, $85,000. Plans deposit $25.

Montana—U. S. Eng., Admin. Bldg., Fort Peck, completion architectural work, appurtenant installations and modifications for power house structure, Fort Peck Dam site on Missouri River, approx. 22 mi. southeast of Glasgow, CIVENG 24-016-52-3.

Nebraska—McCook Public Power Dist., 305 Norris Ave., McCook, 60.96 mi. new line; 33.4 mi. conversion, 2.9 mi. line removal, in Red Willow, Frontier, Hitchcock, Lincoln and Hayes Counties. Plans deposit $10. Philip L. Burns, 630 Davenport Bank Bldg., Davenport, Ia., consult. engrs.

Neb., Sutherland—City, electric sys. extension $77,000. Fulton & Cramer, 922 Trust Bldg., Lincoln, engrs.

Oregon—U. S. Eng., Bldg. 602, City-County Airport, Walla Walla, Wash., 500 kva transformers, McNary Dam, CIVENG 45-154-52-24.

Tex., Abilene—West Texas Utilities Co., Abilene, electric power line extens. $250,000.

Tex., Ozona—West Texas Utilities Co., Abilene, electric power lines, $300,000.

Tex., San Angelo—West Texas Utilities Co., Abilene, electric power lines, $250,000.

Tex., Sonora—West Texas Utilities Co., Abilene, electric power lines, $250,000.

Tex., Sonora—electric power plant imprvs., expansion $750,000.

Washington—Bureau Reclamation, Dpt. Interior, Interior Bldg., 19 and C Sts. N. W., Wash., 25, D. C., third powerhouse, with 750,000 kw capacity at Grand Coulee Dam, Grand Coulee, $150,000,000.

Washington—Bonneville Power Admin., 827 N. E. Oregon St., Portland, Ore., constr. St. Andrews Capacitor Station, Inv. 6058. Plans deposit $25. L. C. Stewart, 827 N. E. Oregon St., Portland, Ore., engr.

Washington—Bonneville Power Admin., P. O. Box 3537, Portland, Ore., convert Vancouver-St. Johns transmission line to higher voltage, $2,855,000; enlarge J. D. Ross sub-station, $200,000.

Alaska, Kodiak—Dpt. Navy, Bureau Yards and Docks, 18 St. and Constitution Ave. N.W. Wash. 25, D. C., bulk fuel facilities, electronics bldg. station access road, ext. utilities, dredging Women's Bay, power plant, barracks, laundry ext., Naval Operating Base, $7,677,800.

Ont., Niagara Falls—Robert H. Saunders, CBE, KC., Chn and Members of Hydro-Electric Power Comn., of Ontario,

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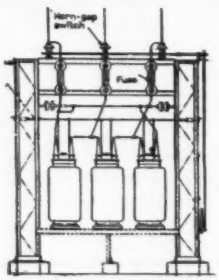

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Write for Bulletin PF-601

SPRAGUE ELECTRIC COMPANY
North Adams, Mass.

620 University Ave., Toronto 2, Ont., Sect. 5, hydraulic tunnel, approx. 3,680 ft. long of circular cross-section, concrete-lined, with 45 ft. finished diam., Sir Adam Beck —Niagara Generating Station No. 2. Plans deposit $1,000.

Low Bidders & Contracts Awarded

Calif., Miramar—Electrical Constructors, P. O. Box 787, Chula Vista, Calif., LB, $491,637, electrical distr. system at Naval Auxiliary Air Station, NOY 29196, Spec. 30846. Eleventh Naval Dist., San Diego, Calif.

Colorado—Hardie-Tynes Mfg. Co., 800 N. 28 St., Birmingham, Ala., LB, $150,000, two 84-in. butterfly valves operating units and handling equipment for Flatiron power and pumping plant, Colorado-Big Thompson Proj. Spec. DS-3518, Colorado. Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo. Bids Sept. 13.

Fla., Miami—J. R. Hime Electric Co., 277 S. County Rd., Palm Beach, Fla., CA, $215,059, exten. runway and taxiway lighting at Miami International Airport. Dade Co., Miami, Fla. Bids Sept. 18.

Oregon—Power City Electric Co., N. 920 Howard St., Spokane, Wash., CA, $361,-905, construct Bandon-Port Orford and Port Orford-Gold Beach 115 kv line, Inv. 6020, Coos and Curry Counties. Bonneville Power Admin., 827 N. E. Oregon St., Portland, Ore. Bids Sept. 12, awarded Sept. 12.

Tex., Dallas—Dallas Power & Light Co., Dallas Power & Light Bldg., Dallas, Tex., Purchase and Hire. $141,940, electric sub-station imprvs. and expansion in Greenville Station area.

Wyoming—Westinghouse Electric Corp., G & E Bldg., Denver, Colo., CA, $149,272, Sch. 1, two transformers with 3 lightning arresters and spare parts for Alcova switch yard. Pacific Electric Mfg. Corp., 5815 3 St., San Francisco, Calif., CA, $72,023, Sch. 2, three circuit breakers with spare parts for Alcova Switchyard, Kendrick Proj. Spec. DS-3491. Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Federal Center, Denver, Colo. Bids Aug. 21, awarded Sept. 14.

Ont., Sarnia—Austin Co. Ltd., 2 E. King St., Toronto, Ont., CA $250,000, electrical sub-station and 2 buildings remodeled; $175,000, pumphouse, etc. Dow Chemical Co. of Canada Ltd., 204 Richmond St., Toronto, Ont.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Ill., Chicago—Loyola University, 820 N. Michigan Ave., Zone 11, plans by Childs & Smith, 20 N. Wacker Dr., Zone 6, medical dental school in West Side Medical Center $7,000,000.

Ill., Seneca—E. I. du Pont de Nemours & Co. du Pont Bldg., Wilmington, Del., altering plant for production of nitric acid, $10,000,000.

Tex., Corpus Christi—Sunray Oil Corp., Philtower Bldg., Tulsa, Okla., oil refinery, $10,000,000. Certificate of Necessity granted. C. H. Wright, First Natl. Bldg., Tulsa, Okla., engr.

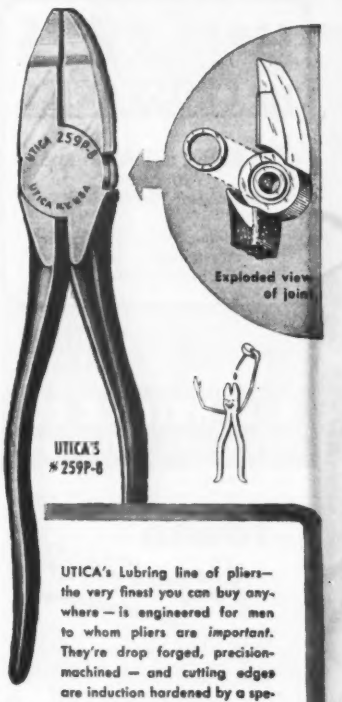
Low Bidders & Contracts Awarded

Minn., Beaver Bay, Hunkin-Conkey Constr. Co., 1740 E. 12 St., Cleveland, O., Arundel Corp., Pier 2 Prat St., Baltimore, Md., and L. E. Dixon Co., 409 S. California St., San Gabriel, Calif. CA $75,000,000. PLANT to process Magnetic Taconite Ore. Reserve Mining Co. (Republic Steel Co., Cleveland, National Steel Co., Pittsburgh, Pa. and Armco of Middletown, O.) Managed by Oglebay-Norton & Co., Hanna Bldg., Cleveland, O.

N. Y. Tonawanda—John W. Cowper Co., Inc., Sidway Bldg., Buffalo, N. Y. CA. Total est. $20,000,000. Substructures and underground work for 3 bldgs., incl. machine shop addn., boiler house addn. and pump house water intake from the Niagara River. Chevrolet Motors Div., General Motors Corp., 3044 W. Grand Blvd., Detroit, Mich. H. E. Beyster & Assoc., Inc., Industrial Bank Bldg., Detroit 26, Mich., engr.-archt. Bids Sept 19.

Tex., Rockdale—Aluminum Co. of America, Port Lavaca, Tex., Separate Contracts under owner's supervision. Approx. $80,000,000-$100,000,000, aluminum smelting and processing plant.

PLIERS THAT OIL THEMSELVES!



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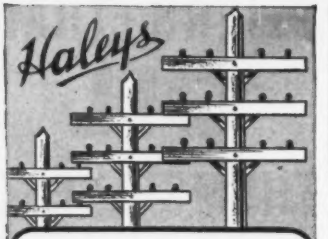

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BOOK REVIEWS

Residential Lighting

Contemporary Lighting in Modern and Traditional Interiors. **A committee report of the Illuminating Engineering Society. Published by the Society, New York 10, N. Y. 64 pages, illustrated. Price $1, single copy. Quantity prices on request.**

This book describes a wide variety of lighting ideas for the principal rooms in present-day homes whether furnished and decorated in modern or any of several traditional styles. There are 130 large-scale illustrations showing actual interiors and sketches of construction details for numerous new ideas in the use of light and color in different home surroundings, from Colonial and Early American through Victorian and Modern decorative schemes. Both installed lighting fixtures and portable lamps are shown in use in every room in the house except the bathroom and kitchen where lighting techniques have been previously established and depend little upon decoration and furnishing. This report should be an excellent working guide for home builders, contractors, architectural or interior designers, homemakers and utility company lighting personnel.

Industrial Plant Planning

Plant Layout—Planning and Practice. **By Randolph W. Mallick and Armand T. Gaudreau. Published by John Wiley & Sons, Inc., New York 16, 391 pages, illustrated. Price $7.50.**

This is a practical book and contains material gathered from actual experience. It is written for the plant engineer and administrative executive. It is also a handy guide for senior and junior engineers and as a reference for engineering and business administration schools and colleges. It features complete engineering techniques for laying out entire plants and modernizing existing layouts. Conservation of space, profitable use of plant services, and scientific analysis of material handling are stressed. It also includes evaluations of capital outlays for plant and equipment; operating costs and projected savings, and proposals for presentation to management.

Nomography

Nomographic Charts. **By C. A. Kulmann. Published by McGraw-Hill Book Co, Inc, New York 18. 244 pages, illustrated. Price $6.50.**

This is a balanced collection of useful charts and in no sense a textbook on the theory and construction of nomographic charts. Each of the 92 is given a full 6x8 page and facing it a discussion of its applicability and scope. Distribution is as follows: 22 mathematical, 28 hydraulic, 12 mechanics, 12 thermodynamics and 17 electrical (of which 9 are for transmission). This constitutes a better and broader selection than found as typical examples of nomographic construction in texts on the subject, consequently it is far more useful for day to day reference.

Transients

Transients in Power Systems. **By H. A. Peterson. Published by John Wiley & Sons, Inc, New York 16. 361 pages, illustrated. Price $6.00.**

This is one of the "G. E. series" and it examines transients as to their origin and behavior on power systems. It discusses the analysis techniques, effect of grounding and reflections, the phenomena of voltage recovery and restrike. Switching, preventive measures, consequences of transformer saturation and of various schemes of metering and relaying are also covered. There is an extensive 1900-1951 bibliography. System analysts and planners can make excellent use of the entire contents.

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CATALOGS • BULLETINS

● MOTOR PROTECTION: High-voltage motor starters providing protection of circuits, motors, and personnel are explained in 12-page booklet DB-4673. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

● MOTOR-GENERATORS: Complete, self-contained, ready to operate electric generating sets, powered by one or two cylinder diesel motors in ratings 6 to 20 kw, 50 or 60 cycles, are described in bulletin 183. Nordberg Manufacturing Co, Milwaukee 7, Wisc.

● MOTOR CONTROLS: A 92-page motor controls catalog of condensed information, dimensions, and prices is available from Allen-Bradley Co, Milwaukee, Wisc.

● CABLE TROUGH: A light, rugged, versatile cable trough adaptable to almost any layout problem is described in 6-page bulletin 64A. T. J. Cope, Inc, 711 South 50th St, Philadelphia 43, Pa.

● RECORDING METERS: Complete information including photographs, charts, and actual chart records of Series 500 Recording Voltmeters and Ammeters, with special emphasis placed on newly developed moving-iron measuring mechanism is presented in this 28-page bulletin, E 1111. The Bristol Company, Waterbury 20, Conn.

● TOOL MACHINE GUIDE: A 4-page, "Operating Guide" fully illustrating how to locate and correct portable pipe and tool machine and hand pipe tool troubles has just been issued by Beaver Pipe Tools, Inc, 334 Dana Ave, Warren, Ohio.

● EXPLOSION PROOF BELLS: Operation and construction features, design and assembly detail, Underwriters' Approvals, etc, featuring Explosion Proof Bells is described in 4-page bulletin EP-85. Signal Engineering & Manufacturing Co, 154 W 14 St., New York 11, N. Y.

● INSTRUMENTATION: Bulletin 328 brings up-to-date specifications for a number of standard instruments. The Baldwin SR-4 torquemeter based on measurement with special SR-4 resistance strain gages is described. Tables for instrument characteristics and standard graduations for instruments ranging from 100 to 30,000 inch pounds are included. Baldwin-Lima-Hamilton Corp, Philadelphia 42, Pa.

● MOTORS: Co-ordinated protection — interlinked protection of circuits, and personnel—is explained in a new 12-page high voltage combination-starter booklet (DB-4673). Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

● VACUUM PUMPS: An edition of the Stokes Vacuum Calculator is now available for free distribution. The slide rule, designed for calculations in vacuum research and processing work performs numerous useful computing chores. F. L. Stokes Machine Co, 5900 Tabor Road, Philadelphia 20, Pa.

● CONTROLS: New 36 page catalog covers Electronik electric control potentiometers for both contact and proportional control. Engineering and constructional data, types of control, partial list of available ranges, application data, and accessories are described. Catalog 15-15 Minneapolis-Honeywell Regulator Co, Wayne and Windrim Aves, Philadelphia 44, Pa.

● SWITCH & BUS INSULATORS: Engineering specifications, cross-section and contour drawings, dimensions and stacking data for Victor switch and bus insulators are included in Bulletin 5. Complete information on clevis-type and tongue—type straight line dead end clamps for use on switchyard and bus installations is given. Victor Insulators, Inc, Victor, N. Y.

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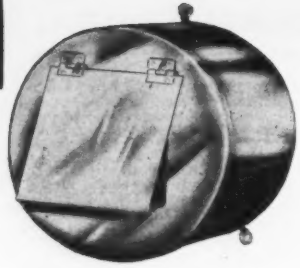

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Research—The third issue of the *NYU Engineering Research Review* is now available. Titanium research, air and water pollution research, and use of minnows for detecting phenol in water are among the topics covered. Copies may be obtained by addressing requests to the Director of the Research Divisions, New York University College of Engineering, New York 53, N. Y.

Bearings—A new 20-page *American Standard on Tolerances for Ball and Roller Bearings* has been announced by the American Standards Association, 70 East 45th St, New York 17. Copies can be obtained for 75c.

Electrical Units—International Standardization Making Progress is a report of International Electrochemical Commission on progress being made in international standardization of electric and magnetic magnitudes and units. One overall objective of this committee is for general acceptance of the MKS System, due to its suitability to engineering work. Copies of this 6-page report may be had from American Standards Association, 70 East 45 Street, New York 17, N. Y.

Metal Powders—Two new standards designed for use by both metal powder producing and consuming industries and metal powder parts users have been released by Metal Powder Association. One standard specifies preferred dimensions and tolerances of oil-impregnated metal powder bearings. Second standard describes a method for determining the green strength of compacted metal powders. Standards may be obtained at 25¢ per copy from Metal Powder Association, 420 Lexington Ave, New York 17, N. Y.

Instruments—Bulletin 51-677 discusses many types of draft and low pressure instruments. Features such as calibrating springs, diaphragm units, and differential valve assemblies are explained. Size, scales, ranges, cases, etc, of each instrument are illustrated and discussed. Copies are available from Hays Corp, Michigan City, Indiana.

Cast Weld Construction—A 9-page booklet citing examples of metals conservation, production economies, improvements in functional design, and other engineering gains in the field of cast-weld construction has been prepared by Steel Founders' Society of America. 16 illustrations typical of product engineering gains, and detailed information on improved cast-weld principles and related redesign considerations are depicted. Copies may be obtained from F. Kermit Donaldson, Steel Founders' Society of America, 920 Midland Building, Cleveland 15, Ohio.

Bus Duct—A 68-page Bus Duct Manual describing advantages of bus duct for varied electrical installations, where bus duct can be used, and protective units available for use with plug-in bus duct has been prepared by Westinghouse. A technical section of the manual presents data, tables, and formulae useful in applying bus duct correctly, and in selecting power takeoff. Voltage drop curves for low impedance bus duct, and test data on plug-in bus duct and short circuit stresses are also included. Copies are available from Westinghouse Electric Corp, Box 2099, Pittsburgh 30.

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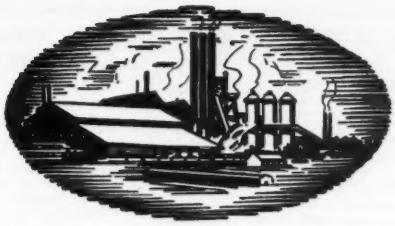

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, AND CIRCULATION REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233)

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5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: 22,175.

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(My commission expires March 30, 1953.)

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3	1000	West.	66000—7200
3	500	G.E.	66000—2400
4	2500	West.	44000—11000
3	1500	Wag.	44000—6900 NEW
3	300	Mol.	44000/22000—440/220
3	75	Mol.	44000—2300/4600
3	3333	West.	43800—13900
1	18750	A.B.B.	34840—11000, 3 ph.
6	150	G.E.	34500—4600/2300
2	7500	West.	33000—13200, 3 ph.
3	200	West.	33000—7200/12470 Y
4	150	G.E.	33000—7200/12470
3	75	Mol.	33000—2300
3	75	Wag.	33000—7200/12470 Y
4	450	A. C.	25410/44000—13280/23000
3	500	A. C.	11000—2300
4	200	Mol.	11000—2300
3	150	Mol.	7620/13200 Y—120/240
3	100	West.	7200—2300
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3	75	West.	6600—460/230

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1	1500	G.E.	720	600	13200
1	1500	G.E.	360		2300/4400
1	1000	Whse.	900	600	4150
1	1000	G.E.	900	260	4100/6900
1	750	Whse.	900	275	2300/4150
2	500	Whse.	900	250	6600/13200
1	400	Whse.	1200	125/250	2300
1	500	G.E.	900	600	2300/4000
1	500	Whse.	900	250	440
1	500	G.E.	720	125	2300
1	400	G.E.	720	250	440/2300
1	250	G.E.	900	125	4150
1	240	G.E.	1200	250	2300

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3—1250	G.E.	HVDDJ	1	6800x550
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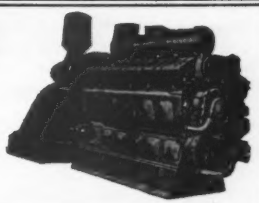

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937.5	General Motors	12-567	1080	720	312	Clark	MD-4	375	327
625	Also	6-12 1/4x13T	750	600	125	Ingersoll Rand	8S	225	514
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400	Buckeye	80	480	600	75	General Motors	6043C	90	1200

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LETTERS TO THE EDITOR

This Makes Us Feel Good

To the Editor:

In answer to your letter of September 13th, I would be delighted to have you print my letter to Mrs. Julia Judson. In an effort to keep up with the ever changing world of industry, (and my husband who is an electrical engineer) I have read many of your informative articles. You can imagine my interest in the article for disabled housewives as I am a paraplegic myself with two small children and I am trying to find the easiest way to do everything.

Sylvia C. Jones

3036-61st St., S.W.
Seattle 6, Washington

Editor's Note: We asked Mrs. Jones if we could print her letter to Mrs. Judson. Here it is—

"In the July 30, 1951 issue of the Electrical World, I saw an interesting article on the work you are doing in the rehabilitation of housewives who are paraplegic. As I am one, and have been for only a year, I am very interested in outfitting a kitchen to suit my needs. The article showed pictures of stove and oven units that can be combined with other units to suit the height of the individual. Could you tell me the brand of these units and if they can be obtained locally or if I have to send to the factory.

"Would it be possible for me to be put on the mailing list for the Self-Help Devices for Rehabilitation booklet that is going to be printed on bathroom equipment and wheel chairs? I would appreciate it very much as we plan to build a house and would like to know what helps could be installed in the bathroom as the house is being constructed."

Non-rust Fencing

To the Editor:

While looking over the August 27th issue of Electrical World, I noted the following article which appears under "Technical Notes" on page 90:

"Fence mesh in a third-degree stage of rust had better be replaced with fresh fabric, preferably stainless steel; painting may prove futile."

For over a quarter of a century we have been selling a non-rusting fence fabric that never needs painting. Many of the utilities throughout the United States are large users of Copperweld Chain Link Fence.

In view of the above, it would have been nice if Copperweld or copper-covered steel had been mentioned in addition to stainless steel.

A. R. Teifeld
Advertising Manager
Copperweld Steel Co
Glassport, Pa

Impossible?

To the Editor:

In the August 27, 1951 issue of "Electrical World," we find on page 87 an article headed "Libby Project Planning Slows Canada Highway." Facts of the subject appear to be in confusion in this article.

Libby Dam is to be built on the Kootenai River in Montana, a few miles upstream from the town of Libby. It will be back water across the boundary about 42 miles to a point just above Wardner, B. C., and will cover an area in Canada of slightly more than 17,000 acres. Some re-location of the roads in the Wardner area will be necessary.

Congress has approved construction of the Libby Dam by the Corps of Engineers, but because it will cause flooding in Canada, the approval of the International Joint Commission is necessary. The matter is now before the Commission for settlement.

The 200 mile Big Bend portion of the Trans-Canada Highway in British Columbia apparently is intended to cover the stretch of highway between Golden and Revelstoke along the main stem of the Columbia. It is hard to understand how flooding of 42 miles of highway routes on the Kootenai (spelled Kootenay in Canada) in Canada near Wardner could force abandonment of work on the Golden - Revelstoke Trans - Canada Highway. It is suggested that the hold-up on this latter stretch might be occasioned by studies and investigations being made by the Canadians of a series of dams on the main stem of the Columbia in this same stretch, and particularly by the site being investigated near the mouth of Mica Creek, about 80 miles upstream from Revelstoke.

John P. Buehler, Colonel
Corps of Engineers, U. S. Army
Seattle, Wash.

NRECA Minute Men

To the Editor:

We have been sending you our regular monthly newsletter each month for several months. We hope you read parts of this message to our member users and learn from it (1) that this is a locally owned, private business rendering service to its member owners only; (2) that we pay taxes to federal, state, and local taxing districts, and assume all other obligations of a self-respecting, honest member of this community.

We hope you learn that we are thoroughly democratic in control, loyal to our government, not socialistic, or communistic, and subscribe to no un-American theories or isms. All of this in spite of statements made against us by those who would oppose or absorb our program.

We are enclosing a little book "Minute Men" prepared by the National Rural Electric Cooperative Assn (not Government) which tells the story of our existence. It points out a social economic condition that existed until our organizations, over 1,000 of them in this country, supplied a very great need to over 3 million American families since 1935. We exist for the benefit of our members. We should be allowed to go forward in our program of service.

A. E. Halterman
Manager
Pioneer Rural Electric Co-op, Inc
Piqua, Ohio

Editor's Note: Electrical World thanks reader Halterman for the chance to become better acquainted with the aims and objectives of the rural electric co-op movement.

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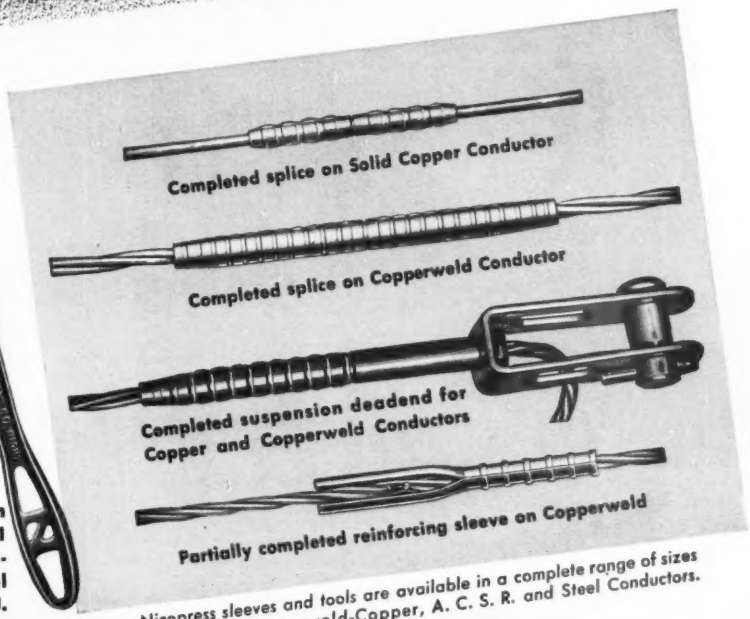
Illustration of No. 51 type Nicopress tool with P. & J. Grooves.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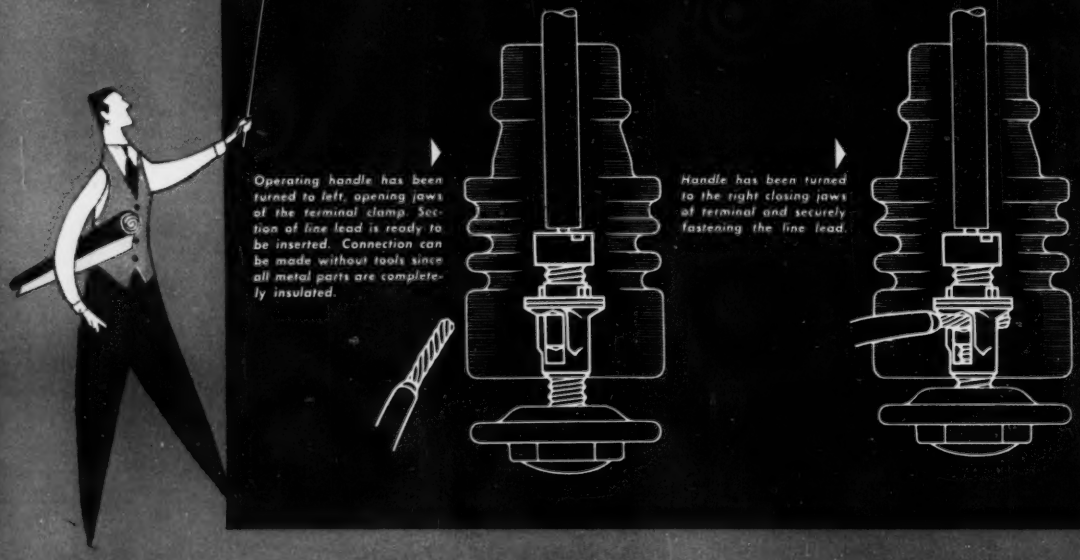
Operating handle has been turned to left, opening jaws of the terminal clamp. Section of line lead is ready to be inserted. Connection can be made without tools since all metal parts are completely insulated.
Handle has been turned to the right closing jaws of terminal and securely fastening the line lead.

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Ask any lineman what he thinks of the Kuhlman "Quick-Grip." Let him tell you how it eases and speeds his job of making line connections by eliminating use of tools. All he does is insert the lead into the hole in the side of the bushing and secure the connection by simply turning the handle on the end of the terminal. That's all there is to it! The clamp accommodates full range of wire sizes prescribed by EEI-NEMA Standards; mounting hardware is inside the tank protected from corrosive effect of the atmosphere.

The "Quick-Grip" is favored too, because of its safety features. Heavy insulating knob prevents accidental contact with live parts. Lead enters through side of bushing eliminating necessity of gripping over the lead when making connections as in the case of a rotating chuck type terminal. Since there is only one entry hole for the lead, its sharp point cannot protrude on the opposite side of the bushing to be a hazard to the lineman.

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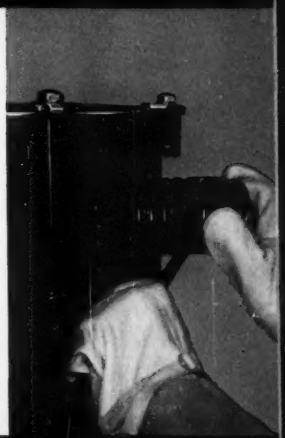

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